Synthesis of Azetidines and Pyrrolidines *via* Iodocyclisation of Homoallyl Amines and Exploration of Activity in a Zebrafish Embryo Assay

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1 Experimental Section

Commercially available solvents and reagents were used without further purification. ^{1}H NMR spectra were recorded at 300 MHz on a Bruker AVIII300 NMR spectrometer, at 400 MHz on a AV400 NMR spectrometer and at 500 MHz on a DRX500 spectrometer, ^{13}C NMR spectra at 100 MHz on a Bruker AVIII400 NMR spectrometer, at 125 MHz on a DRX500 spectrometer are proton decoupled and were recorded at room temperature unless otherwise stated, data was processed with Mestrec version 5.2.5-4731 and Topspin 2.0 (Version of: Nov 9th 2006). Chemical shifts (δ) are reported in ppm relative to TMS (δ 0.00) for the ^{1}H NMR and to chloroform (δ 77.0) for the ^{13}C NMR measurements, coupling constant *J* are expressed in Hertz, pendant technique was used for ^{13}C NMR assignment. Mass spectra were recorded with electrospray MS Waters LCT Time of Flight Mass Spectrometer and with EI (GC/MS) Waters GCT Premier Time of Flight Mass Spectrometer. Infrared Spectra were recorded on a PerkinElmer 100FT-IR spectrometer at room temperature.

1.1 General Synthetic Procedures

1.1.1 General Procedure A:

Five equivalents of $NaHCO_3$ and three equivalents of iodine were added to a homoallylamine derivative in CH_3CN, the mixture was stirred at room temperature for 16 hours and was monitored by TLC. When the reaction was completed solvent was removed *in vacuo*. To the residue thus obtained a solution of $Na_2S_2O_3$ was added, the compound was extracted with EtOAc x 3, washed with water, dried over $MgSO_4$ and solvent removed *in vacuo* to deliver "post-work-up" material.

1.1.2 General Procedure B:

Iodo-azetidine derivatives were refluxed for four hours in CH_3CN. After which the reactions were judged to be complete (by TLC), the solvent was removed *in vacuo* to deliver isomerised iodo-pyrrolidine product.

1.1.3 General Procedure C:

Post-work-up iodo-azetidine derivatives were stirred at room temperature for 24 hours in the corresponding neat amine 10 (mL), after which time $NaHCO_3$ was added and the product extracted with EtOAc x 3, unreacted amine was removed *in vacuo*, the residue was purified by flash chromatography.

1.1.4 General Procedure D:

Post-work up iodo-azetidine derivative (1 equiv.) and sodium azide (2 equiv.) were dissolved in DMF (20 mL) and stirred at room temperature for 16 hours. Alkyne (1 equiv.), copper (I) iodide (2 equiv.) were added and the reaction mixture was stirred at room temperature for 16 hours. The solvent was removed *in vacuo*, EtOAc was added and the resulting suspension was filtered through Celite to remove the inorganic salts. The filtrate was concentrated under reduced pressure and the product was purified by flash chromatography.

1.1.5 General Procedure E:

Post-work up iodo-azetidine derivative (1 equiv.) was heated at 70 °C in DMSO (20 mL) for 4 hours. After being allowed to cool to room temperature, sodium azide (1.5 equiv.) was added and the mixture was stirred at room temperature for 16 hours. Ethynylbenzene (1 equiv.) and copper (I) iodide (2 equiv.) were added and the reaction mixture was heated at 80 °C for 4 hours. The solvent was removed *in vacuo*, ethyl acetate was added and the resulting suspension was filtered through Celite to remove the inorganic salts. The filtrate was concentrated under reduced pressure and the product was purified by flash chromatography.

1.1.6 General Procedure F

Halo-azetidine was stirred with amine (10 equiv.) in DMSO (25 mL) for 48 hours at room temperature. Diethyl either was added and the organic layer washed with a saturated solution of sodium bicarbonate and then water x 3. The solvent was removed *in vacuo* and the product purified by flash chromatography.

1.1.7 General Procedure G

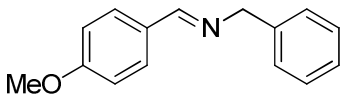
Post-work up iodo-azetidine derivatives were heated at 50 °C in CH_3CN (20 mL) for 4 hours, solvent was removed in *vacuo*, amine (10 equiv.) was added and the mixture was stirred at 80 °C for 16 hours in DMSO. Diethyl either was added and the organic layer washed with a saturated solution of sodium bicarbonate and then water x 3, the residue was concentrated under reduced pressure and purified by flash chromatography.

1.1.8 General Procedure H

Iodo-azetidine derviatives were stirred in a 2 M solution of NaOH (25 mL) and DMSO (25 mL) for 48 hours at room temperature. Diethyl either was added and the organic layer washed with water x 3. The solvent was removed *in vacuo* and purified by flash chromatography.

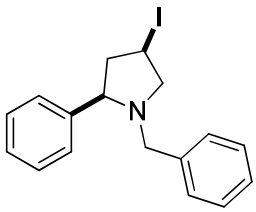
1.1.9 Synthesis

1.1.9.1 (1r) (*E*)-*N*-(4-Methoxybenzylidene)-1-phenylmethanamine



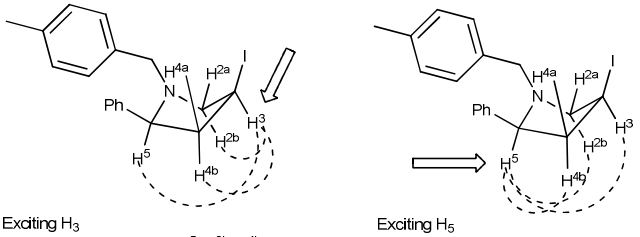
General Procedure A was used. 4-methoxybenzaldehyde (7.34 mmol, 1.00 g), benzylamine (8.08 mmol, 868 mg). Yellow oil, 1.57 g, 95%. ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 3.74 (3H, s, OC*H*$_3$), 4.74 (2H, s, PhC*H*$_2$), 6.88 (2H, d, *J* = 9.0, Ar*H*), 7.19-7.26 (1H, m, Ar*H*), 7.30-7.31 (4H, m, Ar*H*), 7.70 (2H, d, *J* = 8.7, Ar*H*), 8.26 (1H, s, C*H*=N); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 55.36 (CH_3), 65.02 (CH_2), 114.06 (CH), 126.97 (CH), 128.02 (CH), 128.53 (CH), 129.25 (C), 129.91 (CH), 139.73 (C), 161.31 (CH), 161.79 (C). M/z: (ES$^+$) 226.1 $[M + H]^+$.

1.1.9.2 (3c) *cis*-4-Iodo-1-(4-methylbenzyl)-2-phenylpyrrolidine.

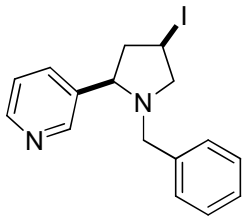


General Procedure B was used, **2c** (20 mg, 0.05 mmol) and acetonitrile (20 mL), yellow oil, 19 mg, 97%. ^{1}H NMR (δ; 500 MHz, $CDCl_3$); 2.35 (s, 3H, Me), 2.41 (m, 1H, PhCHC*H*H), 2.76 (1H, dd, *J* = 10.0 & 5.0, NCH*H*CHI), 2.94 (1H, dt, *J* = 15.0 & 10.0, PhCHCH*H*), 3.43 (1H, dd, *J* = 10.0 & 5.0, NC*H*HCHI), 3.52 (2H, ABq, J_{AB} = 15.0, NC*H*$_2$Ar), 3.57 (1H, $_{apt}$t, $_{obs}J$ = 10.0, PhC*H*CH$_2$), 4.40 (1H, m, NCH$_2$C*H*I), 7.14 (2H, d, *J* = 10.0, Ar*H*), 7.23 (2H, d, *J* = 10.0, Ar*H*), 7.30 (1H, t, *J* = 5.0, Ar*H*), 7.39 (2H, t, *J* = 10.0, Ar*H*), 7.57 (2H, d, *J* = 5.0, Ar*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 17.97 (CH), 21.07 (CH_3), 48.85 (CH_2), 56.32 (CH_2), 64.29 (CH_2), 69.28 (CH), 127.44 (CH), 127.78 (CH), 128.26 (CH), 128.33 (CH), 128.54 (CH), 128.59 (CH), 128.89 (CH), 128.94 (CH), 128.96 (CH), 129.22 (CH), 135.73 (C), 136.41(C), 141.92 (C). High-resolution MS calcd for formula $C_{18}H_{21}NNaI$: 400.0538; found: 400.0542.

3c

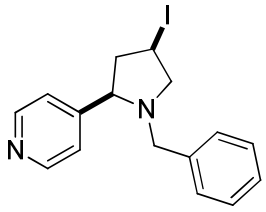


1.1.9.3 (3d) 3-(*cis*-1-Benzyl-4-iodopyrrolidin-2-yl)pyridine.



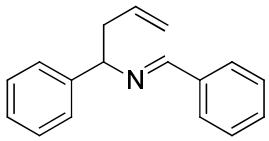
General Procedure B was used, **2d** (50 mg, 0.14 mmol) and acetonitrile (20 mL), yellow oil, 47 mg, 95%. ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.36 (1H, m, PyCHC*H*H), 2.77 (1H, dd, *J* = 12.0 & 6.0, NCH*H*CHI), 2.99 (1H, dt, *J* = 15.0 & 12.0, PyCHCH*H*), 3.42 (1H, dd, *J* = 12.0 & 6.0, NC*H*HCHI), 3.55 (2H, ABq, J_{AB} = 12.0, NCH_2Ph), 3.64 (1H, t, *J* = 9.0, PyC*H*CH_2), 4.40 (1H, m, NCH_2C*H*I), 7.14 (2H, d, *J* = 10.0, Ar*H*), 7.28 (6H, m, Ar*H*), 8.02 (1H, d, *J* = 9.0, Py*H*), 8.55 (1H, d, *J* = 6.0, Py*H*), 8.68 (1H, s, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 17.41 (CH), 48.44 (CH_2), 56.73 (CH_2), 64.38 (CH_2), 66.60 (CH), 123.88 (CH), 126.96 (CH), 128.03 (CH), 128.24(CH), 128.32 (CH), 135.40 (CH), 138.32 (C), 147.60(C), 149.14 (CH), 149.74 (CH). High-resolution MS calcd for formula $C_{16}H_{17}N_2I$: 364.0436; found: 364.0440.

1.1.9.4 (3e) 4-(*cis*-1-Benzyl-4-iodopyrrolidin-2-yl)pyridine.



General Procedure B was used, **2e** (50 mg, 0.14 mmol) and acetonitrile (20 mL), yellow oil, 49 mg, 98%. ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.36 (1H, m, PyCHC*H*H), 2.80 (1H, dd, *J* = 12.0 & 6.0, NCH*H*CHI), 2.99 (1H, dt, *J* = 15.0 & 9.0, PyCHCH*H*), 3.43 (1H, dd, *J* = 12.0 & 6.0, NC*H*HCHI), 3.59 (2H, ABq, J_{AB} = 15.0, NCH_2Ph), 3.65 (1H, $_{apt}$t, $_{obs}J$ = 9.0, PyC*H*CH_2), 4.40 (1H, m, NCH_2C*H*I), 7.30 (5H m, Ar*H*), 7.52 (2H, d, *J* = 6.0, Py*H*), 8.61 (2H, d, *J* = 6.0, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 17.23 (CH), 48.17 (CH_2), 56.98 (CH_2), 64.31 (CH_2), 67.94 (CH), 122.78 (CH), 127.17 (CH), 128.25 (CH), 128.37(CH), 138.21 (C), 150.15 (CH), 151.47 (C). High-resolution MS calcd for formula $C_{18}H_{21}NI$: 364.0436; found 364.0440.

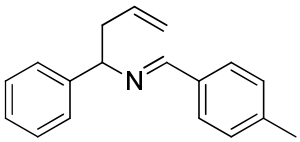
1.1.9.5 (4a) (*E*)-*N*-Benzylidene-1-phenylbut-3-en-1-amine



Procedure: Five equivalent of caesium carbonate (1.37 g, 4.2 mmol) and three equivalent of iodine (640 mg, 2.52 mmol) were added to **1a** (200 mg, 0.84 mmol) in CH_3CN (25 mL), the mixture was stirred at room temperature for 16 hours and was monitored by TLC. When the reaction was completed solvent was removed *in vacuo*. To the residue thus obtained a solution of $Na_2S_5O_3$ was added, the compound was extracted with EtOAc x 3, washed with water, dried over $MgSO_4$ and dried *in vacuo*, the crude product was purified by distillation. Yellow oil, 157 mg, 79%. ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.69 (2H, $_{apt}$t, $_{obs}J$ = 7.5, PhCHCH_2), 4.33 (1H, $_{apt}$t, $_{obs}J$ = 7.5, PhC*H*CH_2), 4.98-5.07 (2H, m, CH=CH_2), 5.64-5.78 (1H, m, C*H*=CH_2), 7.20-7.40 (8H, m, Ar*H*), 7.44 (2H, d, *J* = 7.2, Ar*H*), 7.75-7.78 (2H, m, Ar*H*), 8.28 (1H, s,

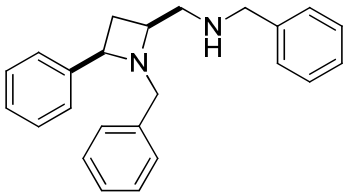
C*H*=N); $^{13}C\{^{1}H\}$ NMR (δ; 100 MHz, $CDCl_3$) 43.26 (CH_2), 75.39 (CH), 117.28 (CH_2), 127.07 (CH), 127.16 (CH), 128.39 (CH), 128.48 (CH), 128.58 (CH), 130.65 (CH), 135.53 (CH), 136.39 (C), 143.93 (C), 160.08 (CH). High-resolution MS calcd for $C_{17}H_{17}N$: 235.1361; found: 235.1355.

1.1.9.6 (4c) (*E*)-*N*-(4-Methylbenzylidene)-1-phenylbut-3-en-1-amine



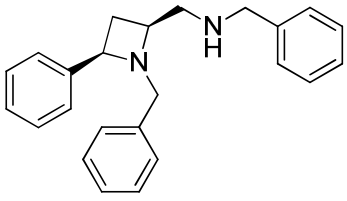
Procedure: Five equivalent of caesium carbonate (3.26 g, 10.0 mmol) and 3 equivalent of I_2 (1.5 g, 6.0 mmol) were added to **1a** (500 mg, 2.0 mmol) in CH_3CN (25 mL), the mixture was stirred at room temperature for 16 hours and was monitored by TLC. When the reaction was completed solvent was removed *in vacuo*. To the residue thus obtained a solution of $Na_2S_SO_3$ was added, the compound was extracted with EtOAc x 3, washed with water, dried over $MgSO_4$ and dried *in vacuo*, the crude product was purified by distillation. Yellow oil, 367 mg, 74%. ^{1}H NMR (δ; 400 MHz, $CDCl_3$); 2.47 (3H, s, Me), 2.83 (2H, $_{apt}$t, $_{obs}J$ = 8, PhCHCH_2), 4.46 (1H, $_{apt}$t, $_{obs}J$ = 7.2, PhC*H*CH_2), 5.12-5.21 (2H, m, CH=CH_2), 5.81-5.92 (1H, m, C*H*=CH_2), 7.28-7.38 (3H, m, Ar*H*), 7.46 (2H, t, *J* = 8, Ar*H*), 7.58 (2H, d, *J* = 7.2 Ar*H*), 7.80 (2H, d, *J* = 8.4, Ar*H*), 8.38 (1H, s, C*H*=N); $^{13}C\{^{1}H\}$ NMR (δ; 100 MHz, $CDCl_3$) 21.59 (CH_3), 43.36 (CH_2), 75.36 (CH), 117.22 (CH_2), 127.19 (CH), 128.38 (CH), 128.42 (CH), 128.48 (CH), 129.32 (CH), 133.89 (C), 135.64 (CH), 140.97 (C), 144.11 (C), 159.90 (CH). High-resolution MS calcd for $C_{18}H_{19}NNa$: 272.1415; found: 272.1425.

1.1.9.7 (6aa) *N*-Benzyl-1-((*cis*)-1-benzyl-4-phenylazetidin-2-yl)methanamine



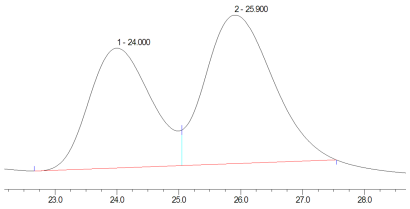
General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography (Hexane/EtOAc = 1/1 Rf 0.4), yellow oil, yield (from **1a**) = 248 mg, 86%. IR 3316, 2983, 1645, 1494, 1453, 1373, 1242, 1158; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.00 (1H, $_{apt}$q, $_{obs}J$= 9.9, PhCHCH*H*), 2.35-2.45 (2H, m, PhCHC*H*H and NCHCH*H*NH), 2.53 (1H, dd, *J* = 12.0 & 4.5, NCHC*H*HNH), 3.28-3.36 (1H, m, C*H*CH_2NH), 3.58 (2H, s, NHCH_2Ph), 3.67 (2H, ABq, J_{AB} = 12.9, NCH_2Ph), 4.02 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH_2), 7.20-7.37 (13H, m, Ph*H*), 7.45-7.48 (2H, m, Ph*H*); $^{13}C\{^{1}H\}$ NMR (δ; 100 MHz, $CDCl_3$), 31.12 (CH_2), 53.75 (CH_2), 54.14 (CH_2), 61.49 (CH_2), 62.72 (CH), 65.24 (CH), 126.67 (CH), 126.85 (CH), 127.05 (CH), 127.93 (CH), 128.14 (CH), 128.18 (CH), 128.23 (CH), 128.49 (CH), 129.11 (CH),138.88 (C), 140.58 (C), 143.54 (C). High-resolution MS calcd for formula $C_{24}H_{27}N_2$: 343.2174; found: 343.2163.

1.1.9.8 (6aa) *N*-(((2*S*,4*R*)-1-benzyl-4-phenylazetidin-2-yl)methyl)propan-1-amine



General Procedure C was used, (*R*)-**1a** (200 mg, 0.84 mmol), flash chromatography (Hexane/EtOAc = 1/1 Rf 0.4), yellow oil, yield (from (*R*)-**1a**) = 242 mg, 84%. HPLC: Chiralpak AD column, detected at 210 nm, eluent: *n*-hexane/*iso*-propanol 99/1, flow rate: 0.250 ml/min. $[\alpha]_D^{20}$ = +96.8 (c 0.32, $CHCl_3$), 99.5% *ee*. IR 3061, 3027, 2821, 1672, 1603, 1494, 1453, 1353, 1206, 1157; ^{1}H NMR and $^{13}C\{^{1}H\}$ NMR same as *rac* **6aa.** High-resolution MS calcd for formula $C_{24}H_{26}N_2Na$: 365.1994; found: 365.1999.

Racemic



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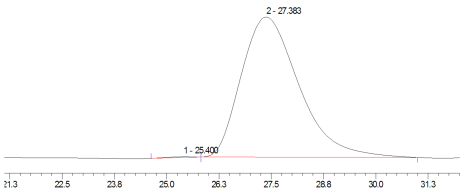
99.5% ee



No.	Ret.Time	Height	Area	Rel.Area
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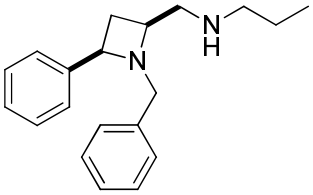
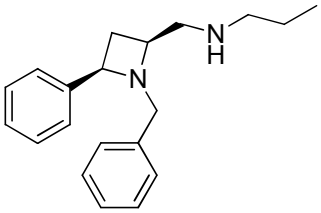
2	27.38	939.967	1503.597	99.77
Total:		944.677	1507.134	100.00

1.1.9.9 (6ab) *N*-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)propan-1-amine



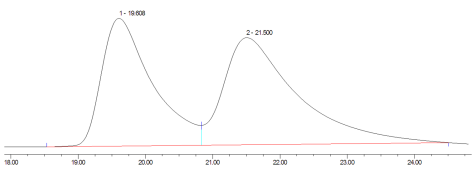
General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 216 mg, 87%. IR 3313, 2944, 2832, 1449, 1115; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.84 (3H, t, *J* = 7.5, Me), 1.30-1.42 (2H, m,C*H*$_2$CH$_3$), 1.91-2.00 (1H, m, PhCHCH*H*), 2.26-2.50 (5H, m, NHC*H*$_2$CH$_2$, PhCHC*H*H, NCHCH*H*NH, NH), 2.57 (1H, dd, *J* = 12.3 & 4.2, NCHC*H*HNH), 3.29-3.37 (1H, m, NC*H*CH$_2$NH), 3.68 (2H, ABq, J_{AB} = 12.6, NC*H*$_2$Ph), 4.03 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH$_2$), 7.24-7.38 (8H, m, Ph*H*), 7.46-7.49 (2H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 11.68 (CH_3), 22.61 (CH_2), 31.27 (CH_2), 51.84 (CH_2), 54.03 (CH_2), 61.44 (CH_2), 62.32 (CH), 65.30 (CH), 126.84 (CH), 127.13 (CH), 128.22 (CH), 129.14 (CH), 138.92 (C), 143.31 (C). High-resolution MS calcd for formula $C_{20}H_{27}N_2$: 295.2174; found: 295.2162.

1.1.9.10 (6ab) *N*-(((2*S*,4*R*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)propan-1-amine



General Procedure C was used, (*R*)-**1a** (400 mg, 1.68 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from (*R*)-**1a**) = 377 mg, 76%. HPLC: Chiralpak AD column, detected at 210 nm, eluent: *n*-hexane/*iso*-propanol 95/5, flow rate: 0.250 ml/min. $[\alpha]_D^{20}$ = +97.2 (c 1.17, $CHCl_3$), 92.5% *ee*. IR 3029, 2960, 2933, 2873, 1654, 1493, 1454, 1382, 1156; ^{1}H NMR and ^{13}C{^{1}H} NMR same as *rac* **6ab.** High-resolution MS calcd for formula $C_{20}H_{27}N_2$: 295.2174; found: 295.2179.

Racemic



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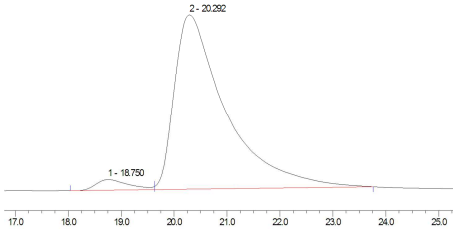
92.5% ee



No.	Ret.Time	Height	Area	Rel.Area
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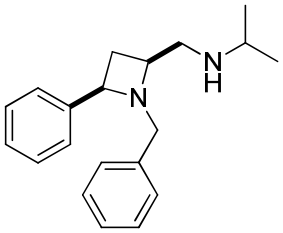
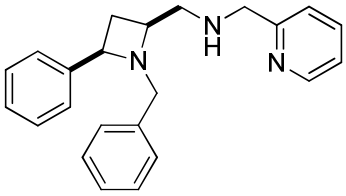
2	21.50	308.704	391.150	54.85	*2*	20.29	882.679	996.706	96.27
Total:		676.662	713.109	100.00	*Total:*		936.334	1035.306	100.00

1.1.9.11 (6ac) *N*-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)propan-2-amine



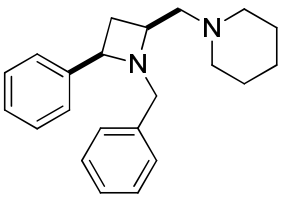
General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 206 mg, 83%. IR 3661, 3300, 3062, 3027, 2927, 2969, 1649, 1603, 1494, 1454, 1382, 1250, 1172, 1066; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.87 (3H, d, *J* = 6, Me), 0.96 (3H, d, *J* = 6, Me), 1.96 (1H, $_{apt}$q, $_{obs}J$ = 8.4, PhCHCH*H*), 2.35 (1H, dd, *J* = 11.7 & 4.8, NCHC*H*HNH), 2.41-2.52 (2H, m, PhCHC*H*H & NHC*H*$(CH_3)_2$), 2.58 (1H, dd, *J* = 11.7 & 4.8, NCHCH*H*NH), 3.31-3.38 (1H, m, NC*H*CH_2NH), 3.67 (2H, ABq, J_{AB} = 12.9, NCH_2Ph), 4.04 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH_2), 7.25-7.38 (8H, m, Ph*H*), 7.48 (2H, d, *J*= 6.9, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 21.63 (CH_3), 22.21 (CH_3), 31.24 (CH_2), 49.27 (CH), 51.64 (CH_2), 61.40 (CH_2), 62.30 (CH), 65.33 (CH), 126.84 (CH), 127.20 (CH), 127.27 (CH), 128.26 (CH), 128.34 (CH), 129.21 (CH), 139.00 (C), 143.11 (C). High-resolution MS calcd for formula $C_{20}H_{27}N_2$: 295.2174; found: 295.2172.



1.1.9.12 (6ad) 1-((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)-*N*-(pyridin-2-ylmethyl)methanamine

General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 199 mg, 69%. IR 3311, 3061, 3029, 2926, 2820, 1671, 1590, 1570, 1493, 1474, 1454, 1433, 1356, 1289, 1210, 1149; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.00 (1H, $_{apt}$q, $_{obs}J$ = 8.4, PhCHCH*H*), 2.39-2.49 (2H, m, PhCHC*H*H and NCHCH*H*NH), 2.55 (1H, dd, *J* = 12.3 & 4.2, NCHC*H*HNH), 2.92 (1H, br, NH), 3.29-3.37 (1H, m, C*H*CH_2NH), 3.67 (2H, ABq, J_{AB} = 12.9, NCH_2Ph), 3.74 (2H, s, NHCH_2Py), 4.02 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH_2), 7.10-7.35 (13H, m, Ph*H*), 7.46-7.48 (1H, m, Ph*H*), 7.60 (1H, td; *J* = 7.8 & 1.8, Py*H*), 8.52-8.54 (1H, m, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 31.13 (CH_2), 53.69 (CH_2), 55.29 (CH_2), 61.42 (CH_2), 62.28 (CH), 65.26 (CH), 121.78 (CH), 121.91 (CH), 126.86 (CH), 127.05 (CH), 128.10 (CH), 128.17 (CH), 129.18 (CH), 136.35 (CH), 138.65 (C), 143.47 (C),149.30 (CH), 159.83 (C). High-resolution MS calcd for formula $C_{23}H_{26}N_3$: 344.2126; found: 344.2118.

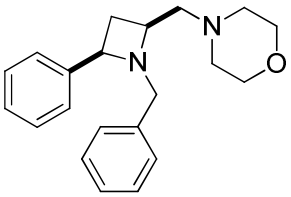
1.1.9.13 (6ae) 1-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)piperidine



General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography (Hexane/EtOAc = 1/1 Rf 0.3), yellow oil, yield (from **1a**) = 229 mg, 85%. IR 3062, 3027, 2933, 2852, 2799, 1676, 1603, 1521, 1493, 1453, 1382, 1353, 1324, 1273, 1252, 1209, 1156, 1122; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.37-1.42 (2H, m, $NCH_2CH_2CH_2$), 1.50-1.57 (4H, m, NCH_2CH_2), 1.79 (1H, dt, *J* = 9.9 & 8.7, PhCHCH*H*), 2.23-2.35 (6H, m, NCH_2CH_2 & $NCHCH_2N$), 2.57 (1H, dt, *J* = 9.9 & 8.7, PhCHC*H*H), 3.28-3.37 (1H, m, NC*H*CH_2N), 3.70 (2H, ABq, J_{AB} = 12.9,

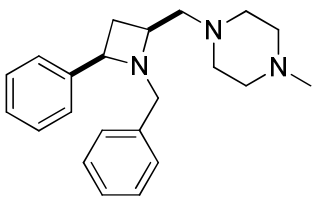
NC*H*$_2$Ph), 4.00 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH$_2$), 7.19-7.32 (8H, m, Ph*H*), 7.39-7.42 (2H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 24.21 (CH_2), 25.89 (CH_2), 35.57 (CH_2), 55.16 (CH_2), 60.92 (CH), 61.25 (CH_2), 65.36 (CH_2), 65.90 (CH), 126.78 (CH), 126.88 (CH), 127.89 (CH), 128.04 (CH), 129.47 (CH), 138.43 (C), 143.67 (C). High-resolution MS calcd for formula $C_{22}H_{29}N_2$: 321.2330; found: 321.2327.

1.1.9.14 (6af) 4-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)morpholine



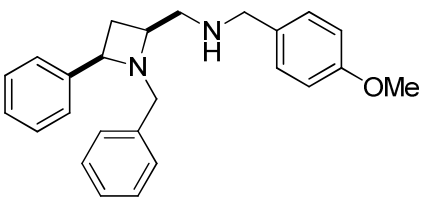
General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography (Hexane/EtOAc = 1/1 Rf 0.3), yellow oil, yield (from **1a**) = 192 mg, 71%. IR 3061, 3028, 2954, 2853, 2807, 1641, 1603, 1566, 1493, 1454, 1357, 1327, 1302, 1277, 1241, 1207, 1139; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.83 (1H, dt, *J* = 9.9 & 8.7, PhCHCH*H*), 2.26-2.44 (6H, m, NCHC*H*$_2$N & NC*H*$_2$CH$_2$O), 2.55 (1H, dt, *J* = 9.9 & 8.7, PhCHC*H*H), 3.27-3.36 (1H, m, NC*H*CH$_2$N), 3.66 (4H, t, *J* = 4.8, C*H*$_2$O), 3.71 (2H, ABq, J_{AB} = 12.9, NC*H*$_2$Ph), 4.02 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH$_2$), 7.21-7.36 (8H, m, Ph*H*), 7.43 (2H, dd, *J* = 8.1 & 1.5, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 34.71 (CH_2), 54.29 (CH_2), 60.54 (CH), 61.35 (CH_2), 64.74 (CH_2), 65.79 (CH), 66.91 (CH_2), 126.77 (CH), 126.93 (CH), 127.01 (CH), 127.96 (CH), 128.12 (CH), 129.45 (CH), 138.39 (C), 143.52 (C). High-resolution MS calcd for formula $C_{21}H_{26}N_2ONa$: 345.1943; found: 345.1939.

1.1.9.15 (6ag) 1-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)-4-methylpiperazine



General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 228 mg, 81%. IR 3675, 3391, 2988, 2972, 2901, 2800, 1634, 1603, 1565, 1493, 1453, 1406, 1394, 1381, 1264, 1231, 1165, 1066, 1056; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.80 (1H, dt, *J* = 9.9 & 8.7, PhCHCH*H*), 2.27 (3H, s, Me), 2.30-2.49 (10H, m, NCHC*H*$_2$N & NC*H*$_2$C*H*$_2$N), 2.55 (1H, dt, *J* = 9.9 & 8.7, PhCHC*H*H), 3.27-3.36 (1H, m, NC*H*CH$_2$N), 3.69 (2H, ABq, J_{AB} = 12.9, NC*H*$_2$Ph), 4.00 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH$_2$), 7.18-7.33 (8H, m, Ph*H*), 7.41 (2H, dd, *J* = 8.25 & 1.5, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 35.05 (CH_2), 45.05 (CH_3), 53.69 (CH_2), 55.03 (CH_2), 60.69 (CH), 61.31 (CH_2), 64.30 (CH_2), 65.85 (CH), 126.75 (CH), 126.89 (CH), 126.94 (CH), 127.93 (CH), 128.08 (CH), 129.45 (CH), 138.38 (C), 143.56 (C). High-resolution MS calcd for formula $C_{22}H_{30}N_3$: 336.2439; found: 336.2427.

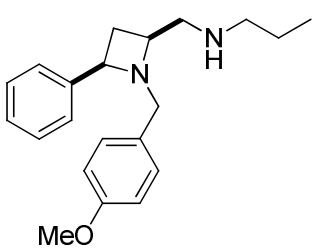
1.1.9.16 (6ah) 1-((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)-*N*-(4-methoxybenzyl)methanamine.



General Procedure C was used, **1a** (200 mg, 0.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 245 mg, 78%. IR 3300, 2926, 1611, 1584, 1512, 1496, 1454, 1349, 1304, 1250, 1178, 1073; ^{1}H NMR (δ; 400 MHz, $CDCl_3$); 1.61 (1H, br, N*H*), 1.88 (1H, m, PhCHCH*H*), 2.27

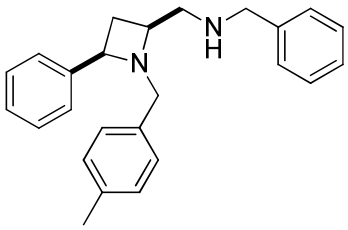
(2H, m, PhCHC*H*H and NCHCH*H*NH), 2.40 (1H, dd, *J* = 12.0 & 6.0, NCHC*H*HNH), 3.19 (1H, m, C*H*CH_2NH), 3.53 (2H, ABq, J_{AB} = 9.0, NCH_2Ph), 3.61 (2H, ABq, J_{AB} = 3.0, NHCH_2Ar), 3.69 (3H, s, OMe), 3.89 (1H, $_{apt}$t, $_{obs}J$ = 12.0, PhC*H*CH_2), 6.70 (2H, d, *J* = 6.0, Ar*H*), 7.00 (2H, d, *J* = 9.0, Ar*H*), 7.12 (8H, m, Ph*H*), 7.34 (2H, d, *J* = 9.0, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 30.78 (CH_2), 53.15 (CH_2), 53.96 (CH_2), 61.48 (CH_2), 62.52 (CH), 62.96 (CH), 123.29 (CH), 126.96 (CH), 127.30 (CH), 128.10 (CH), 128.24 (CH), 129.16 (CH), 134.66 (CH), 138.10 (C), 138.58 (C), 139.80 (C), 148.52 (CH), 148.74 (CH). High-resolution MS calcd for formula $C_{25}H_{29}N_2O$: 373.2280; found: 373.2277.

1.1.9.17 (6bb) *N*-(((*cis*)-1-(4-Methoxybenzyl)-4-phenylazetidin-2-yl)methyl)propan-1-amine



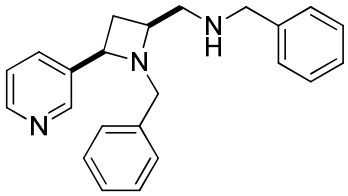
General Procedure C was used, **1b** (760 mg, 2.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1b**) = 682 mg, 74%. IR 3315, 2936, 1625, 1544, 1426, 1319, 1273, 1178; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.85 (3H, t, *J* = 7.5, Me), 1.32-1.44 (2H, m, C$H_2$$CH_3$), 1.95 (1H, $_{apt}$q, $_{obs}J$ = 8.7, PhCHCH*H*), 2.27-2.50 (4H, m, NHC$H_2$$CH_2$, PhCHC*H*H, NCHCH*H*NH), 2.57 (1H, dd, *J* = 12.1 & 4.5 NCHC*H*HNH), 3.28-3.36 (1H, m, NC*H*CH_2NH), 3.62 (2H, ABq, J_{AB} = 12.9, NCH_2Ar), 3.80 (3H, s, OCH_3), 4.01 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH_2), 6.84 (2H, d, *J* = 8.4, Ar*H*), 7.24-7.29 (3H, m, Ar*H*), 7.35 (2H, t, *J* = 7.5, Ar*H*), 7.45-7.48 (2H, m, Ar*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 11.68 (CH_3), 22.66 (CH_2), 31.18 (CH_2), 51.91 (CH_2), 54.15 (CH_2), 55.26 (CH_3), 60.66 (CH_2), 62.00 (CH), 65.09 (CH), 113.65 (CH), 126.81 (CH), 127.12 (CH), 128.23 (CH), 130.24 (CH), 130.95 (C), 143.34 (C), 158.84 (C). High-resolution MS calcd for formula $C_{21}H_{29}N_2O$: 325.2280; found: 325.2285.

1.1.9.18 (6ca) *N*-Benzyl-1-((*cis*)-1-(4-methylbenzyl)-4-phenylazetidin-2-yl)methanamine



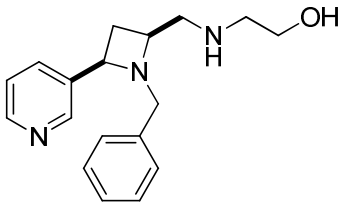
General Procedure C was used, **1c** (530 mg, 2.11 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1c**) = 564 mg, 75%. IR 3653, 3284, 2956, 2878, 2753, 2528, 1596, 1496, 1476, 1467, 1382, 1345, 1289, 1215, 1112; ^{1}H NMR (δ; 500 MHz, $CDCl_3$); 2.01 (1H, $_{apt}$q, $_{obs}J$ = 10.0, PhCHCH*H*), 2.33 (3H, s, Me), 2.41-2.48 (2H, m, PhCHC*H*H and NCHCH*H*NH), 2.58 (1H, dd, *J* = 12.0 & 4.5, NCHC*H*HNH), 3.32-3.37 (1H, m, NC*H*CH_2NH), 3.61 (2H, ABq, J_{AB} = 13.0, NHCH_2Ph), 3.66 (2H, ABq, J_{AB} = 13.0, NCH_2Ar), 4.03 (1H, $_{apt}$t, $_{obs}J$ = 8.5, PhC*H*CH_2), 7.08 (2H, d, *J* = 8.0, Ar*H*), 7.21-7.39 (10H, m, Ar*H*), 7.49 (2H, d, *J* = 8.0, Ar*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 21.12 (CH_3), 31.08 (CH_2), 53.68 (CH_2), 53.97 (CH_2), 61.02 (CH_2), 62.28 (CH), 65.07 (CH), 126.80 (CH), 126.85 (CH), 127.07 (CH), 128.02 (CH), 128.22 (CH), 128.26 (CH), 128.90 (CH), 129.07 (CH), 135.73 (C), 136.66 (C), 140.01 (C), 143.49 (C). High-resolution MS calcd for formula $C_{25}H_{28}N_2Na$: 379.2150; found: 379.2144.

1.1.9.19 (6da) *N*-Benzyl-1-(*cis*-1-benzyl-4-(pyridin-3-yl)azetidin-2-yl)methanamine.



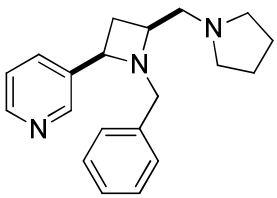
General Procedure C was used, **1d** (328 mg, 1.37 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1d**) = 340 mg, 72%. IR 3302, 3027, 2819, 1643, 1578, 1494, 1479, 1453, 1427, 1356, 1314, 1207, 1156; ^{1}H NMR (δ; 400 MHz, $CDCl_3$); 1.31 (1H, br, NH), 2.16 (1H, $_{apt}$q, $_{obs}J$ = 8.0, PyCHCH*H*), 2.52 (2H, m, PyCHC*H*H and NCHCH*H*NH), 2.83 (1H, dd, *J* = 12.0 & 4.0, NCHC*H*HNH), 3.56 (1H, m, NC*H*CH_2NH), 3.68 (2H, ABq, J_{AB} = 12.0, NCH_2Ph), 3.92 (2H, ABq, J_{AB} = 12.0, NHCH_2Ph), 4.08 (1H, $_{apt}$t, $_{obs}J$ = 8.0, PyC*H*CH_2), 7.16 (1H, t, *J* = 8.0, Ar*H*), 7.21 (1H, t, *J* = 8.0, Ar*H*), 7.23 (2H, t, *J* = 8.0, Ar*H*), 7.28 (1H, d, *J* = 8.0, Ar*H*), 7.29 (2H, d, *J* = 8.0, Ar*H*), 7.34 (2H, m, Ar*H*), 7.38 (2H, d, *J* = 12.0, Ar*H*), 7.69 (1H, dt, *J* = 8.0 & 4.0, Ar*H*), 8.42 (dd, 1H, *J* = 6.0 & 4.0, Py*H*), 8.91 (1H, s, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 30.78 (CH_2), 53.15 (CH_2), 53.96 (CH_2), 61.48 (CH_2), 62.52 (CH), 62.96 (CH), 123.29 (CH), 126.96 (CH), 127.30 (CH), 128.10 (CH), 128.24 (CH), 129.16 (CH), 134.66 (CH), 138.10 (C), 138.58 (C), 139.80 (C), 148.52 (CH), 148.74 (CH). High-resolution MS calcd for formula $C_{23}H_{25}N_3Na$: 366.1946; found: 366.1949.

1.1.9.20 (6di) 2-((((*cis*)-1-Benzyl-4-(pyridin-3-yl)azetidin-2yl)methyl)amino)ethanol



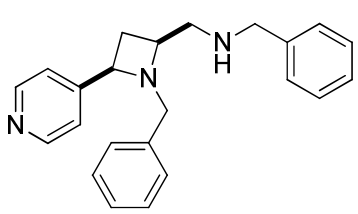
General Procedure C was used, **1d** (410 mg, 1.72 mmol), flash chromatography ($CHCl_3$/MeOH = 1/1 Rf 0.4), yellow oil, yield (from **1d**) = 419 mg, 82%. IR 3333, 2939, 2829, 1639, 1596, 1580, 1495, 1454, 1359, 1315, 1209, 1155; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.25 (1H, $_{apt}$q, $_{obs}J$ = 9.3, PyCHCH*H*), 2.62-2.94 (7H, m, NCHCH_2NH, PyCHC*H*H, C$H_2$$CH_2$OH, N*H*, O*H*), 3.59-3.67 (1H, m, NC*H*CH_2NH), 3.79 (2H, t, *J* = 5.1, CH_2OH), 3.95 (2H, ABq, J_{AB} = 12.6, NCH_2Ph), 4.32 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PyC*H*CH_2), 7.49-7.56 (6H, m, Ar*H*), 8.06 (1H, dd, $_{obs}J$ = 7.8 & 1.2, Py*H*), 8.75 (1H, d, *J* = 4.5, Py*H*), 8.88 (1H, s, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 30.83 (CH_2), 51.17 (CH_2), 53.13 (CH_2), 60.58 (CH_2), 61.53 (CH_2), 62.68 (CH), 62.85 (CH), 123.32 (CH), 127.32 (CH), 128.22 (CH), 129.17 (CH), 134.56 (CH), 138.14 (C), 138.54 (C), 148.50 (CH), 148.63 (CH). High-resolution MS calcd for formula $C_{18}H_{23}N_3ONa$: 320.1739; found: 320.1744.

1.1.9.21 (6dj) 3-((*cis*)-1-Benzyl-4-(pyrrolidin-1-ylmethyl)azetidin-2-yl)pyridine



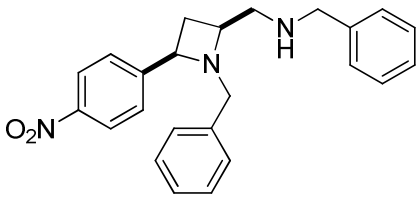
General Procedure C was used, **1d** (200 mg, 0.84 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1d**) = 196 mg, 76%. IR 3413, 3029, 2960, 2690, 2195, 1635, 1495, 1453, 1430, 1357, 1317, 1189, 1156; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.01-2.08 (5H, m, $NCH_2C$$H_2$ & PyCHCH*H*), 2.75 (1H, dd, *J* = 12.3 & 3.0, NCHC*H*HN), 2.83 (1H, dt, *J* = 10.5 & 7.5, PyCHC*H*H), 2.94-3.02 (1H, m, NCHCH*H*N), 3.15 (4H, br, NC$H_2$$CH_2$), 3.71 (2H, ABq, J_{AB} = 12.3, NCH_2Ph), 3.77-3.84 (1H, m, NC*H*CH_2N), 4.11 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PyC*H*CH_2), 7.18-7.31 (6H, m, Ar*H*), 7.68 (1H, dt, *J* = 7.8 & 2.1, Py*H*), 8.44 (1H, d, *J* = 4.8, Py*H*), 8.57 (1H, d, *J* = 1.8, Py*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 23.26 (CH_2), 34.82 (CH_2), 54.44 (CH_2), 57.91 (CH), 59.70 (CH_2) 60.98 (CH), 63.47 (CH), 123.31 (CH), 127.72 (CH), 128.51 (CH), 129.65 (CH), 134.43 (CH), 136.85 (C), 137.37 (C), 148.48 (CH), 148.80 (CH). High-resolution MS calcd for formula $C_{20}H_{25}N_3Na$: 330.1946; found: 330.1940.

1.1.9.22 (6ea) *N*-Benzyl-1-((*cis*)-1-benzyl-4-(pyridin-4-yl)azetidin-2yl)methanamine



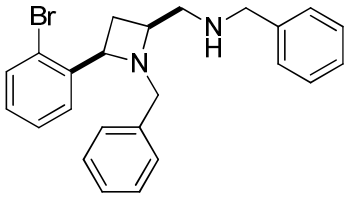
General Procedure C was used, **1e** (600 mg, 2.52 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1e**) = 615 mg, 71%. IR 3031, 2818, 1671, 1600, 1495, 1453, 1412, 1311, 1356, 1206, 1156; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.96 (1H, $_{apt}$q, $_{obs}J$ = 9.0, PyCHCH*H*), 2.41-2.50 (2H, m, PyCHC*H*H and NCHCH*H*NH), 2.56 (1H, dd, *J* = 12.3 & 4.5, NCHC*H*HNH), 2.94 (1H, br, N*H*), 3.35-3.45 (1H, m, NC*H*CH_2NH), 3.63 (2H, s, NHCH_2Ph), 3.68 (2H, ABq, J_{AB} = 15.0, NCH_2Ph), 4.02 (1H, $_{apt}$t, $_{obs}J$ = 9.0, PyC*H*CH_2), 7.19-7.40 (12H, m, Ar*H*), 8.50 (2H, d, *J* = 5.1, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 30.39 (CH_2), 53.14 (CH_2), 53.91 (CH_2), 61.68 (CH_2), 62.52 (CH), 63.92 (CH), 121.64 (CH), 126.93 (CH), 127.38 (CH), 128.03 (CH), 128.27(CH), 128.34 (CH), 129.15 (CH), 138.03 (C), 139.87 (C), 149.56 (CH), 152.37 (C). High-resolution MS calcd for formula $C_{23}H_{26}N_3$: 344.2126; found: 344.2130.

1.1.9.23 (6fa) *N*-Benzyl-1-((*cis*)-1-benzyl-4-(4-nitrophenyl)azetidin-2-yl)methanamine



General Procedure C was used, **1f** (200 mg, 0.71 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1f**) = 208 mg, 76%. IR 3062, 3028, 2924, 2851, 1671, 1599, 1516, 1494, 1453, 1343, 1287, 1213, 1157; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.70 (1H, br, NH), 1.94-2.03 (1H, $_{apt}$q, $_{obs}J$ = 8.7, ArCHCH*H*), 2.46-2.54 (2H, m, ArCHC*H*H and NCHCH*H*NH), 2.59 (1H, dd, *J* = 12.0 & 4.2, NCHC*H*HNH), 3.38-3.45 (1H, m, NC*H*CH_2NH), 3.67 (2H, s, NHCH_2Ph), 3.70 (2H, ABq, J_{AB} = 12.3, NCH_2Ph), 4.13 (1H, $_{apt}$t, $_{obs}J$ = 8.1, ArC*H*CH_2), 7.20-7.37 (10H, m, Ar*H*), 7.55 (2H, d, *J* = 8.7, Ar*H*), 8.14 (2H, d, *J* = 8.7, Ar*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$) 30.99 (CH_2), 53.35 (CH_2), 54.11 (CH_2), 61.73 (CH_2), 62.65 (CH), 64.53 (CH), 123.47 (CH), 126.85 (CH), 127.37 (CH), 127.95 (CH), 128.25 (CH), 137.98 (C), 140.39 (C), 146.95 (C), 151.22 (C). High-resolution MS calcd for formula $C_{24}H_{26}N_3O_2$: 388.2025; found: 388.2023.

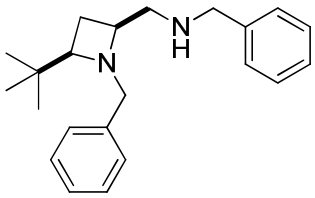
1.1.9.24 (6ga) *N*-Benzyl-1-((*cis*)-1-benzyl-4-(2-bromophenyl)azetidin-2-yl)methanamine



General Procedure C was used, **1g** (1.30 g, 4.11 mmol), flash chromatography (Hexane/EtOAc = 1/1 Rf 0.4), yellow oil, yield (from **1g**) = 1.26 g, 65%. IR 3675, 2988, 2901, 1406, 1394, 1250, 1075, 1066, 1056; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.54 (1H, br, NH), 1.81 (1H, dt, *J* = 10.2 & 8.4, ArCHCH*H*), 2.36 (1H, dd, *J* = 12.0 & 4.5, NCHCH*H*NH), 2.50 (1H, dd, *J* = 12.0 & 4.5, NCHC*H*HNH), 2.70 (1H, dt, *J* = 10.2 & 8.4, ArCHC*H*H), 3.37-3.45 (1H, m, C*H*CH_2NH), 3.58 (2H, $_{apt}$d, $_{obs}J$ = 3.3, NHCH_2Ph), 3.71 (2H, ABq, J_{AB} = 12.9, NCH_2Ph), 4.36 (1H, $_{apt}$t, $_{obs}J$ = 8.1, ArC*H*CH_2), 7.15 (1H, td, *J* = 7.5 & 1.8, Ar*H*), 7.18-7.40 (11H, m, Ar*H*), 7.50 (1H, dd, *J* = 7.8 & 1.2, Ar*H*), 7.84 (1H, dd, *J* = 7.6 & 1.5, Ar*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 30.17 (CH_2), 53.79 (CH_2), 54.06 (CH_2), 61.77 (CH_2), 62.79 (CH), 64.24 (CH), 121.94 (C), 126.69 (CH), 127.25 (CH), 127.39 (CH),

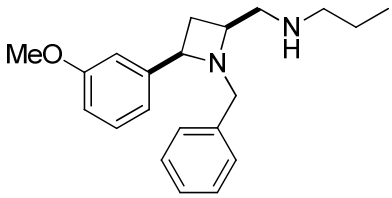
127.91 (CH), 128.12 (CH), 128.24 (CH), 128.27 (CH), 129.13 (CH), 132.20 (CH), 138.74 (C), 140.49 (C), 142.60 (C). High-resolution MS calcd for formula $C_{24}H_{26}N_2Br$: 421.1279; found: 421.1271.

1.1.9.25 (6ha) *N*-Benzyl-1-((*cis*)-1-benzyl-4-(*tert*-butyl)azetidin-2-yl)methanamine



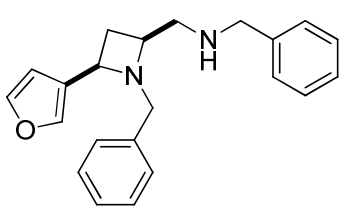
General Procedure C was used, **1h** (928 mg, 4.27 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1h**) = 1.18 g, 86%. IR 3675, 3214, 2987, 2969, 2901, 1664, 1603, 1494, 1476, 1453, 1394, 1360, 1250, 1229, 1075, 1066, 1056; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.00 (9H, s, *tert*-butyl), 1.89 (1H, dt, *J* = 10.5 & 8.4, *tert*-butylCHCH*H*), 2.04 (1H, dt, *J* = 10.5 & 8.4, *tert*-butylCHC*H*H), 2.29 (1H, dd, *J* = 12.0 & 4.5, NCHC*H*HNH), 2.48 (1H, dd, *J* = 12.0 & 4.5, NCHCH*H*NH), 2.93 (1H, $_{apt}$t, $_{obs}J$ = 8.4, *tert*-butylC*H*CH_2), 3.17 (1H, m, C*H*CH_2NH), 3.59 (2H, s, NHC*H*$_2$Ph), 3.77 (2H, ABq, J_{AB} = 13.5, NHC*H*$_2$Ph), 7.24-7.44 (10H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 22.13 (CH_2), 26.17 (CH_3), 33.8 (C), 54.11 (CH_2), 54.28 (CH_2), 62.47 (CH), 64.22 (CH_2), 71.88 (CH), 126.62 (CH), 127.0 (CH), 127.87 (CH), 128.23 (CH), 128.82 (CH), 140.28 (C), 140.73 (C). High-resolution MS calcd for formula $C_{22}H_{31}N_2$: 323.2487; found: 323.2471.

1.1.9.26 (6ib) *N*-(((*cis*)-1-Benzyl-4-(3-methoxyphenyl)azetidin-2-yl)methyl)propan-1-amine



General Procedure C was used, **1i** (700 mg, 2.62 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1i**) = 723 mg, 85%. IR 3290, 2966, 2937, 2876, 1654, 1602, 1549, 1454, 1372, 1239, 1155; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.86 (3H, t, *J*= 7.5, Me), 1.37-1.49 (2H, m,C*H*$_2$$CH_3$), 2.05-2.21 (2H, m, *J* = 8.7, PhCHCH*H*, NHC*H*H$CH_2$$CH_3$), 2.26 (1H, dd, *J* = 12.3 & 4.8, NCHCH*H*NH), 2.40-2.54 (2H, m, PhCHC*H*H & NHCH*H*$CH_2$$CH_3$), 2.70 (1H, dd, *J* = 12.3 & 4.8, NCHC*H*HNH), 3.38-3.45 (1H, m, NC*H*CH_2NH), 3.69 (2H, ABq, J_{AB} = 12.6, NC*H*$_2$Ph), 3.85 (3H, s, OC*H*$_3$), 4.08 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH_2), 6.83 (1H, dd, *J* = 8.2 & 2.7, Ar*H*), 7.01-7.05 (2H, m, Ar*H*), 7.25-7.37 (6H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 11.47 (CH_3), 21.96 (CH_2), 30.68 (CH_2), 51.38 (CH_2), 52.87 (CH_2), 55.33 (CH_3), 61.21 (CH_2), 65.33 (CH), 112.20 (CH), 112.84 (CH), 119.05 (CH), 127.50 (CH), 128.13 (CH), 128.56 (CH), 129.21 (CH), 129.40 (CH), 138.69 (C), 144.41 (C), 159.78 (C). High-resolution MS calcd for formula $C_{21}H_{29}N_2O$: 325.2280; found: 325.2270.

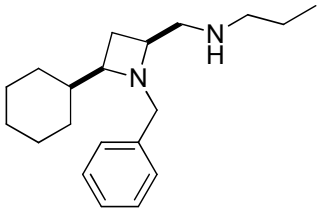
1.1.9.27 (6ja) *N*-Benzyl-1-((*cis*)-1-benzyl-4-(furan-3-yl)azetidin-2-yl)methanamine



General Procedure C was used, **1j** (758 mg, 3.30 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1j**) = 867 mg, 79%. IR 3197, 3027, 2934, 2858, 2797, 1642, 1594, 1544, 1523, 1495, 1453, 1416, 1380, 1338, 1265, 1227, 1197, 1166; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.76 (1H, br, NH), 2.09 (1H, $_{apt}$q, $_{obs}$ *J* = 9.0, ArCHCH*H*), 2.32-2.40 (1H, m, ArCHC*H*H), 2.41 (1H, dd, *J* = 12.0 & 4.2, NCHC*H*HNH), 2.55 (1H, dd, *J* = 12.0 & 4.2, NCHCH*H*NH), 3.25-3.33 (1H, m, C*H*CH_2NH), 3.62 (2H, s, NHC*H*$_2$Ph), 3.68 (2H, ABq, J_{AB} = 12.9, NC*H*$_2$Ph), 3.95 (1H, $_{apt}$t, $_{obs}J$ = 9.0, ArC*H*CH_2), 6.42 (1H, s, Ar*H*), 7.18-7.44 (12H, m, Ar*H*);

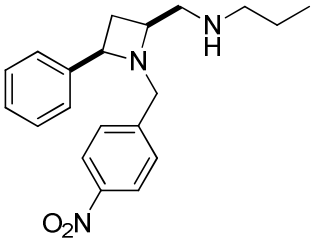
$^{13}C\{^{1}H\}$ NMR (δ; 100 MHz, $CDCl_3$) 29.58 (CH_2), 53.48 (CH_2), 54.19 (CH_2), 56.96 (CH), 61.45 (CH_2), 62.87 (CH), 109.41 (CH), 126.72 (CH), 127.10 (CH), 127.94 (CH), 128.10 (C), 128.14 (CH), 128.26 (CH), 129.13 (CH), 138.75 (C), 139.28 (CH), 140.08 (C), 142.91 (CH). High-resolution MS calcd for formula $C_{22}H_{25}N_2O$: 333.1964; found: 333.1962.

1.1.9.28 (6kb) *N*-(((*cis*)-1-Benzyl-4-cyclohexylazetidin-2-yl)methyl)propan-1-amine



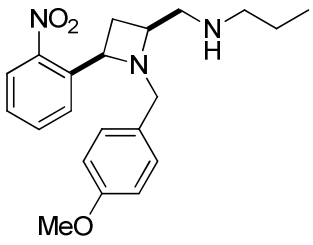
General Procedure C was used, **1k** (840 mg, 3.50 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1k**) = 852 mg, 81%. IR 2922, 2850, 1641, 1494, 1449, 1351, 1260, 1073; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.82 (3H, t, *J* = 7.5, Me), 0.89-0.96 (2H, m, NCHCHC*H*H), 1.23-1.35 (5H, m, $NHCH_2CH_2CH_3$, NCHCHCH$_2$C*H*H, NCHCHCH$_2$CH$_2$C*H*H, NCHC*H*), 1.61-1.75 (6H, m, NCHCHCH*H*, NCHCHCH$_2$CH*H*, NCHCHCH$_2$CH$_2$CH*H*, $NHCH_2CH_2$), 2.06-2.35 (4H, m, $NHCH_2CHCHH$, $NHCH_2CH_2CH_3$, NCHC*H*HNH), 2.40 (1H, dd, *J* = 12.0 & 4.2, NCHCH*H*NH), 2.78 (1H, $_{apt}$q, $_{obs}J$ = 8.4, NC*H*CH), 3.05-3.15 (1H, m, NC*H*CH$_2$NH), 3.65 (2H, ABq, J_{AB} = 12.6, NCH_2Ph), 7.25-7.36 (5H, m, Ph*H*); $^{13}C\{^{1}H\}$ NMR (δ; 100 MHz, $CDCl_3$), 11.68 (CH_3), 22.70 (CH_2), 22.51 (CH_2), 25.95 (CH_2), 26.64 (CH_2), 28.12 (CH_2), 29.57 (CH_2), 29.70 (CH_2), 44.38 (CH), 51.91 (CH_2), 54.31 (CH_2), 62.45 (CH), 63.55 (CH_2), 67.67 (CH) ,127.08 (CH), 128.22 (CH), 129.05 (CH), 139.60 (C). High-resolution MS calcd for formula $C_{20}H_{33}N_2$: 301.2643; found: 301.2636.

1.1.9.29 (6lb) *N*-(((*cis*)-1-(4-Nitrobenzyl)-4-phenylazetidin-2-yl)methyl)propan-1-amine



General Procedure C was used, **1l** (279 mg, 0.99 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1l**) = 275 mg, 82%. IR 3387, 2925, 2851, 1604, 1518, 1493, 1456, 1344, 1261, 1159; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.89 (3H, t, *J* = 7.2, Me), 1.50-1.63 (2H, m,CH_2CH$_3$), 2.00 (1H, dt, *J* = 10.8 & 8.4, PhCHCH*H*), 2.57-2.72 (4H, m, NHCH_2CH$_2$, PhCHC*H*H, NCHCH*H*NH), 2.79 (1H, dd, *J* = 12.4 & 3.9, NCHC*H*HNH), 3.45-3.54 (1H, m, NC*H*CH$_2$NH), 3.80 (2H, ABq, J_{AB} = 13.2, NCH_2Ar), 4.03 (1H, $_{apt}$t, *J* = 8.1, PhC*H*CH$_2$), 7.26-7.37 (5H, m, Ph*H*), 7.44 (2H, d, *J* = 8.4, Ar*H*), 8.09 (2H, d, *J* = 8.4, Ar*H*); $^{13}C\{^{1}H\}$ NMR (δ; 100 MHz, $CDCl_3$), 11.32 (CH_3), 20.57 (CH_2), 32.43 (CH_2), 50.37 (CH_2), 52.09 (CH_2), 60.30 (CH), 60.56 (CH_2), 66.28 (CH), 123.40 (CH), 126.81 (CH), 127.68 (CH), 128.35 (CH), 129.77 (CH), 141.93 (C), 145.86 (C), 147.18 (C). High-resolution MS calcd for formula $C_{20}H_{25}NO_2$: 340.2025; found: 340.2023.

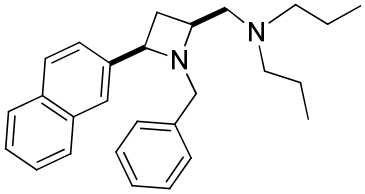
1.1.9.30 (6mb) *N*-(((*cis*)-1-(4-Methoxybenzyl)-4-(2-nitrophenyl)azetidin-2-yl)methyl)propan-1-amine



General Procedure C was used, **1m** (200 mg, 0.64 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1m**) = 163 mg, 69%. IR 2959, 2932, 2874, 1611, 1584, 1523, 1513, 1463, 1346, 1248, 1176, 1109; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.77 (3H, t, *J* = 7.5, Me), 1.22-1.32 (2H, m, CH_2CH$_3$), 1.73 (1H, dt, *J* = 10.5 & 8.4, ArCHCH*H*), 2.22-2.37 (3H, m, NHCH_2CH$_2$, NCHCH*H*NH), 2.46 (1H, dd, *J* = 12.2

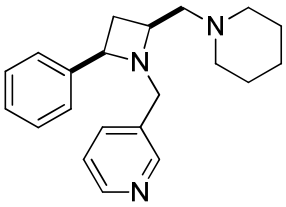
& 4.8, NCHC*H*HNH), 2.73 (1H, dt, *J* = 10.5 & 8.4, ArCHC*H*H), 3.29-3.36 (1H, m, NC*H*CH$_2$NH), 3.53 (2H, ABq, J_{AB} = 12.6, NC*H*$_2$Ar), 3.72 (3H, s, OC*H*$_3$), 4.47 (1H, $_{apt}$t, $_{obs}J$ = 8.4, ArC*H*CH$_2$), 6.76 (2H, d, *J* = 8.7, Ar*H*), 7.18 (2H, d, *J* = 8.7, Ar*H*), 7.30 (1H, t, *J* = 7.2, Ar*H*), 7.57 (1H, t, *J* = 7.2, Ar*H*), 7.90 (1H, d, *J* = 7.2, Ar*H*), 8.10 (1H, d, *J* = 7.2, Ar*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$) 11.71 (CH_3), 22.94 (CH_2), 31.18 (CH_2), 51.98 (CH_2), 54.63 (CH_2), 55.26 (CH_3), 61.14 (CH_2), 61.50 (CH), 62.32 (CH), 113.71 (CH), 124.33 (CH), 127.40 (CH), 128.91 (CH), 130.24 (CH), 130.52 (C), 133.56 (CH), 139.55 (C), 147.31 (C), 158.92 (C). High-resolution MS calcd for formula $C_{21}H_{27}N_3O_3Na$: 392.1950; found: 392.1951.

1.1.9.31 (6ra) *N*-(((*cis*)-1-benzyl-4-(naphthalen-2-yl)azetidin-2-yl)methyl)-N-propylpropan-1-amine



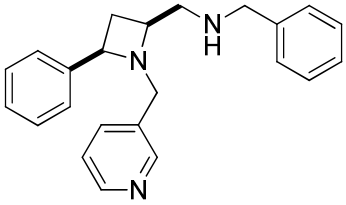
General Procedure C was used, **1r** (273 mg, 0.95 mmol), yield (from **1r**) = 100 mg, 50%. IR 2956, 2924, 1666, 1454; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.80 (3H, t, *J* = 9.0, NCH$_2$CH$_2$C*H*$_3$), 1.27-1.29 (4H, m, NCH$_2$C*H*$_2$CH$_3$), 1.76 (1H, $_{apt.}$q, $_{obs.}J$ = 9.0 NaphCHCH*H*), 2.18-2.39 (6H, m, NC*H*$_2$CH$_2$CH$_3$ & NCHC*H*$_2$N), 2.91 (1H, dt, *J* = 9.0 & 6.0, NaphCHC*H*H), 3.39-3.50 (1H, m, NC*H*CH$_2$N), 3.66 (2H, ABq, J_{AB} = 12.0, NC*H*$_2$Ph), 4.73 (1H, $_{apt.}$t, $_{obs.}J$ = 9.0, NaphC*H*CH$_2$), 7.26-7.96 (12H, m, Ph*H* & Naph*H*); ^{13}C {^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 11.83 (CH_3), 20.10 (CH_2), 29.70 (CH_2), 35.22 (CH_2), 56.92 (CH_2), 59.99 (CH), 62.01 (CH), 62.75 (CH_2), 122.91 (CH), 122.99 (CH), 125.34 (CH), 125.78 (CH), 126.74 (CH), 128.14 (CH), 129.60 (CH), 130.27 (C), 133.59 (C), 138.76 (C), 139.60 (C). High-resolution MS calcd for formula $C_{27}H_{34}N_2$: 387.5802; found: 387.2819.

1.1.9.32 (6sa) 3-(((*cis*)-2-phenyl-4-(piperidin-1-ylmethyl)azetidin-1-yl)methyl)pyridine



General procedure C was used, **1s** (130 mg, 0.56 mmol), yield (from **1s**) = 130 mg, 81%. IR 3028, 2934, 2852, 2803,1576, 1492, 1454, 1424, 1354, 1326, 1303, 1157; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.35-1.45 (2H, m, NCH$_2$CH$_2$C*H*$_2$), 1.57-1.68 (4H, m, NCH$_2$C*H*$_2$CH$_2$), 1.80 (1H, $_{apt.}$q, $_{obs.}J$ = 9.0, PhCHCH*H*), 2.40-2.47 (6H, m, NC*H*$_2$CH$_2$CH$_2$ & NCHC*H*$_2$N), 2.60 (1H, dt, *J* = 9.0 & 6.0, PhCHC*H*H), 3.46 (1H, $_{apt.}$qn, $_{obs.}J$ = 6.0, NC*H*CH$_2$N), 3.67-3.77 (2H, m, NC*H*$_2$Py), 3.75 (2H, d), 4.00 (1H, $_{apt.}$t, $_{obs.}J$ = 9.0, PhC*H*CH$_2$), 7.08-7.35 (6H, m, Ph*H* & Py*H*), 7.59 (1H, dt, *J* = 6.0 & 3.0, Py*H*), 8.39 (1H, dd, *J* = 6.0 & 3.0, Py*H*), 8.49 (1H, s, Py*H*); ^{13}C {^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 23.71 (CH_2), 25.18 (CH_2), 35.43 (CH_2), 54.94 (CH_2), 58.54 (CH_2), 60.33 (CH), 64.75 (CH_2), 66.34 (CH), 122.95 (CH), 126.78 (CH), 127.21 (CH), 128.16 (CH), 133.81 (C), 137.02 (CH), 142.93 (C), 148.35 (CH), 150.45 (CH). High-resolution MS calcd for formula $C_{21}H_{27}N_3$ 322.4671; found 322.4684.

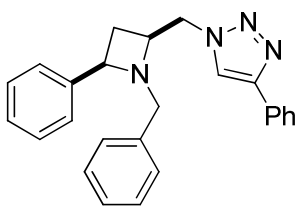
1.1.9.33 (6sb) *N*-benzyl-1-((*cis*)-4-phenyl-1-(pyridin-3-ylmethyl)azetidin-2-yl)methanamine



General procedure C was used, **1s** (260 mg, 1.0 mmol), yield (from **1s**) = 250 mg, 65%. IR 3027, 2824, 1673, 1576, 1493, 1478, 1452, 1424, 1354, 1260, 1157; ^{1}H NMR

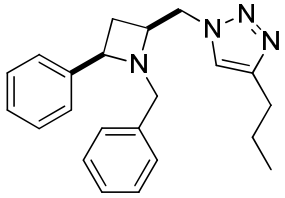
(δ; 300 MHz, $CDCl_3$); 2.01 (1H, dt, *J* = 12.0 & 9.0, PhCHCH*H*), 2.40-2.49 (2H, m, PCHC*H*H & NCHCH*H*NH), 2.56 (1H, dd, *J* = 12.0 & 6.0, NCHC*H*HNH), 3.28-3.37 (1H, m, NC*H*CH_2NH), 3.66 (2H, s, NHCH_2Ph), 3.67 (2H, ABq, J_{AB} = 12.0, NCH_2Py), 3.99 (1H, $_{apt}$t, $_{obs}$*J* = 9.0, PhC*H*CH_2), 7.06-7.40 (6H, m, Ph*H* & Py*H*), 7.55 (1H, dt, *J* = 6.0 & 3.0, Py*H*), 8.39 (1H, dd, *J* = 6.0 & 3.0, Py*H*), 8.49 (1H, s, Py*H*); $^{13}C\{^1H\}$ NMR (δ; 100 MHz, $CDCl_3$), 31.26 (CH_2), 53.28 (CH_2), 54.00 (CH_2), 58.76 (CH_2), 62.59 (CH), 65.76 (CH), 123.03 (CH), 126.90 (CH), 126.94 (CH), 127.24 (CH), 128.04 (CH), 128.22 (CH), 128.38 (CH), 134.07 (C), 136.69 (CH), 143.00 (C), 148.48 (CH), 150.21 (CH). High-resolution MS calcd for formula $C_{23}H_{26}N_3$ 344.4726; found 344.4627.

1.1.9.34 (7aa) 1-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)-4-phenyl-1H-1,2,3-triazole



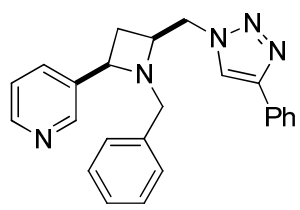
General procedure D was used, post-work up halo-azetidine **2a** (1.00 g, 2.70 mmol), sodium azide (357 mg, 5.50 mmol), DMF (20 mL), ethynylbenzene (276 mg, 2.70 mmol), copper (I) iodide (1.05 g, 5.50 mmol), flash chromatography (Hexane/EtOAc = 6/4 Rf 0.4), yellow oil, yield (from **1a**) = 680 mg, 53%. IR 3675, 2971, 2901, 2163, 1493, 1453, 1406, 1393, 1066, 1056; ^1H NMR (δ; 300 MHz, $CDCl_3$); 1.72 (1H, dt, *J* = 10.8 & 8.4, PhCHCH*H*), 2.48 (1H, dt, *J* = 10.8 & 8.4 , PhCHC*H*H), 3.62-3.70 (1H, m, NC*H*CH_2N), 3.71 (2H, ABq, J_{AB} = 12.3, NCH_2Ph), 3.94 (1H, dd, *J* = 14.2 & 3.6, NCHCH*H*N), 4.06 (1H, $_{apt}$t, $_{obs}$*J* = 8.1, PhC*H*CH_2), 4.29 (1H, dd, *J* = 14.2 & 3.6, NCHC*H*HN), 7.21-7.40 (11H, m, Ph*H*), 7.48 (2H, t, *J* = 7.8, Ph*H*), 7.65 (1H, s, C*H*N_3), 7.83-7.86 (2H, m, Ph*H*); $^{13}C\{^1H\}$ NMR (δ; 100 MHz, $CDCl_3$), 30.18 (CH_2), 53.53 (CH_2), 61.21 2 x (CH), 64.97 (CH_2), 121.41 (CH), 125.71 (CH), 126.73 (CH), 127.43 (CH), 127.67 (CH), 127.97 (CH), 128.29 (CH), 128.57 (CH), 128.81 (CH), 129.54 (CH), 130.90 (C), 137.87 (C), 142.27 (C), 147.26 (C). High-resolution MS calcd for formula $C_{25}H_{25}N_4$: 381.2079; found 381.2078.

1.1.9.35 (7ab) 1-(((*cis*)-1-Benzyl-4-phenylazetidin-2-yl)methyl)-4-propyl-1H-1,2,3-triazole



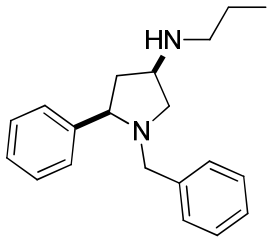
General procedure D was used, post-work up halo-azetidine **2a** (895 mg, 2.50 mmol), sodium azide (320 mg, 5.00 mmol), DMF (20 mL), 1-pentyne (170 mg, 2.50 mmol), copper (I) iodide (952 mg, 5.00 mmol), flash chromatography (Hexane/EtOAc = 6/4 Rf 0.4), yellow oil, yield (from **1a**) = 516 mg, 59%. IR 3062, 3029, 2958, 2927, 2870, 1673, 1603, 1551, 1494, 1383, 1358, 1287, 1214, 1157; ^1H NMR (δ; 300 MHz, $CDCl_3$); 1.01 (3H, t, *J* = 7.2, Me), 1.62-1.77 (3H, m, PhCHCH*H* & C$H_2$$CH_3$), 2.42 (1H, dt, *J* = 10.8 & 7.2, PhCHC*H*H), 2.68-2.74 (2H, m, N=NCCH_2), 3.58 (1H, m, NC*H*CH_2N), 3.66 (2H, ABq, J_{AB} = 12.6, NCH_2Ph), 3.85 (1H, dd, *J* = 14.2 & 3.6, NCHCH*H*N), 4.01 (1H, $_{apt}$t, $_{obs}$*J* = 8.1, PhC*H*CH_2), 4.20 (1H, dd, *J* = 14.25 & 3.6, NCHC*H*HN), 7.19 (1H, s, C*H*N_3) 7.22-7.34 (10H, m, Ph*H*); $^{13}C\{^1H\}$ NMR (δ; 100 MHz, $CDCl_3$), 13.85 (CH_3), 22.83 (CH_2), 27.70 (CH_2), 30.28 (CH_2), 53.31 (CH_2), 61.13 2 x (CH), 64.89 (CH_2), 122.32 (CH), 126.72 (CH), 127.37 (CH), 127.55 (CH), 128.19 (CH), 128.46 (CH), 128.88 (C), 129.53 (CH), 137.79 (C), 142.38 (C). High-resolution MS calcd for formula $C_{22}H_{26}N_4Na$: 369.2055; found 369.2039.

1.1.9.36 (7da) 3-(*cis*-1-Benzyl-4-((4-phenyl-1H-1,2,3-triazol-1-yl)methyl)azetidin-2-yl)pyridine.



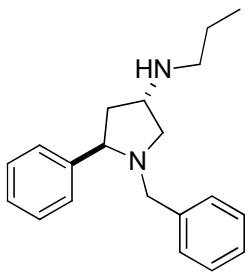
General procedure D was used, post-work halo-azetidine up **2d** (500 mg, 1.37 mmol) and sodium azide (178 mg, 2.74 mmol) DMF (20 mL), ethynylbenzene (140 mg, 1.37 mmol), copper (I) iodide (521 mg, 2.74 mmol), flash chromatography ($CHCl_3$/MeOH = 95/5 Rf 0.4), yellow oil, yield (from **1d**) = 303 mg, 46%. IR 3029, 2915, 2850, 1578, 1454, 1427, 1383, 1311, 1222, 1178; ^{1}H NMR (δ; 500 MHz, $CDCl_3$); 1.82 (1H, $_{apt}$q, $_{obs}J$ = 10.0, PyCHCH*H*), 2.56 (1H, $_{apt}$q, $_{obs}J$ = 10.0, PyCHC*H*H), 3.68 (2H, ABq, J_{AB} = 10.0, NCH_2Ph), 3.74 (1H, m, NC*H*CH_2N), 4.08 (1H, dd, *J* = 12.5 & 5.0, NCHCH*H*N), 4.15 (1H, m, PyC*H*CH_2), 4.36 (1H, d, *J* = 15.0, NCHC*H*HN), 7.10 (1H, m, Py*H*), 7.27 (1H, t, *J* = 10.0, Ph*H*), 7.29 (2H, d, *J* = 5.0, Ph*H*), 7.31 (2H, t, *J* = 10.0, Ph*H*), 7.37 (1H, t, *J* = 10.0, Ph*H*), 7.47 (2H, t, *J* = 10.0, Ph*H*), 7.59 (1H, d, *J* = 5.0, Ph*H*), 7.62 (1H, s, C*H*N_3), 7.81 (2H, d, *J* = 10.0, Py*H*), 8.35 (2H, br, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 28.97 (CH_2), 52.54 (CH_2), 60.75 (CH), 60.75 (CH_2), 61.75 (CH), 121.84 (CH), 123.64 (CH), 125.20 (CH), 125.22 (CH), 127.77 (CH), 128.03 (CH), 128.58 (CH), 128.83 (CH), 129.39 (CH), 130.06 (C), 137.00 (C), 137.20 (C), 146.70 (C), 147.80 (CH), 148.40 (CH). High-resolution MS calcd for formula $C_{24}H_{23}N_5Na$: 404.1851; found 404.1839.

1.1.9.37 (8ab) (*cis*)-1-Benzyl-5-phenyl-*N*-propylpyrrolidin-3-amine



General procedure F was used, **1a** (100 mg, 0.42 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 96 mg, 78%. IR 3662, 2923, 2852, 1641, 1494, 1451, 1379, 1256, 1066; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.90 (3H, t, *J* = 7.5, Me), 1.47-1.59 (2H, m, $CH_2CH_2CH_3$), 1.61-1.71 (1H, m, PhCHC*H*H), 2.39 (1H, dd, *J* = 10.1 & 7.3, NC*H*HCHNH), 2.48-2.60 (3H, m, *J* = 7.5, PhCHCH*H* & NHCH_2), 3.06 (1H, dd, $_{obs}J$ = 10.1 & 1.8, NCH*H*CHNH), 3.28-3.35 (1H, m, NCH_2CHNH), 3.41 (1H, dd, *J* = 9.6 & 7.0, PhC*H*CH_2), 3.45 (2H, ABq, J_{AB} = 13.2, NCH_2Ph), 7.23-7.39 (8H, m, Ph*H*), 7.45-7.52 (2H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 11.77 (CH_3), 22.74 (CH_2), 43.12 (CH_2), 49.33 (CH_2), 55.61 (CH), 57.53 (CH_2), 58.46 (CH_2), 68.80 (CH), 126.75 (CH), 127.25 (CH), 127.49 (CH), 128.13 (CH), 128.53 (CH), 129.19 (CH), 139.14 (C), 142.62 (C). High-resolution MS calcd for formula $C_{20}H_{27}N_2$: 295.2174; found: 295.2171.

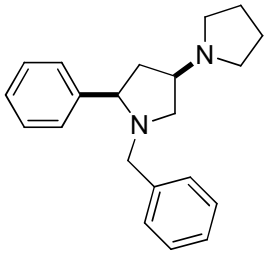
1.1.9.38 (8ab) (*trans*)-1-Benzyl-5-phenyl-*N*-propylpyrrolidin-3-amine



General procedure G was used, **1a** (50 mg, 0.21 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 46 mg, 74%. IR 3675, 3391, 2966, 2930, 2796, 1602, 1493, 1453, 1376, 1288, 1241, 1075, 1066; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.92 (3H, t, *J* = 7.5, Me), 1.56-1.68 (2H, m, $CH_2CH_2CH_3$), 2.03-2.23 (3H, m, PhCHC*H*H, PhCHCH*H*, NC*H*HCHNH), 2.50 (2H, t, *J* = 7.5, NHCH_2), 3.39-3.53 (2H, m, NCH*H*CHNH & NCH_2CHNH), 3.45 (2H, ABq, J_{AB} = 12.9, NCH_2Ph), 3.72 (1H, $_{apt}$t, $_{obs}J$ = 8.1, PhC*H*CH_2), 7.23-7.30 (6H, m, Ph*H*), 7.33-7.39 (2H, m, Ph*H*), 7.45-7.48 (2H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 11.69 (CH_3), 22.53 (CH_2), 41.95 (CH_2), 49.85 (CH_2), 55.53 (CH), 57.66 (CH_2), 59.50 (CH_2), 67.82 (CH), 126.83 (CH),

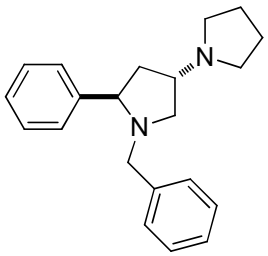
127.24 (CH), 127.56 (CH), 128.16 (CH), 128.52 (CH), 128.59 (CH), 139.21 (C), 142.88 (C). High-resolution MS calcd for formula $C_{20}H_{27}N_2$: 295.2174; found: 295.2155.

1.1.9.39 (8aj) (*cis*)-1'-Benzyl-5'-phenyl-1,3'-bipyrrolidine



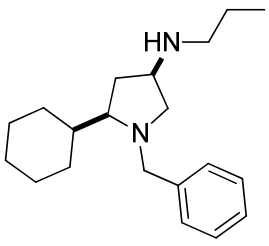
General procedure F was used, **1a** (100 mg, 0.42 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 104 mg, 81%. IR 3414, 3061, 3028, 2962, 2790, 1602, 1493, 1453, 1331, 1289, 1208, 1154; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.86-1.96 (5H, m, NCH_2CH_2 & PhCHCH*H*), 2.42-2.51 (1H, m, NC*H*HCHN & PhCHC*H*H), 2.77 (4H, br, NCH_2CH_2), 3.22 (1H, dd, *J* = 10.95 & 3.0, NCH*H*CHN), 3.24 (1H, br, NCH_2CHN), 3.46 (2H, ABq, J_{AB} = 13.5, NCH_2Ph), 3.52 (1H, dd, *J* = 10.6 & 5.8, PhC*H*CH_2), 7.21-7.40 (8H, Ph*H*), 7.51-7.54 (2H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 23.75 (CH_2), 40.77 (CH_2), 51.55 (CH_2), 56.40 (CH), 57.80 (CH_2), 60.93 (CH), 69.05 (CH_2), 126.93 (CH), 127.40 (CH), 127.59 (CH), 128.26 (CH), 128.37 (CH), 128.66 (CH), 138.89 (C), 141.85 (C). High-resolution MS calcd for formula $C_{21}H_{27}N_2$: 307.2174; found: 307.2171.

1.1.9.40 (8aj) (*trans*)-1'-Benzyl-5'-phenyl-1,3'-bipyrrolidine



General procedure G was used, **1a** (400 mg, 1.68 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1a**) = 403 mg, 78%. IR 3402, 3028, 2875, 2793, 1453, 1374, 1154; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.87 (4H, br, NCH_2CH_2), 2.00 (1H, dt, *J* = 13.3 & 9.0 PhCHC*H*H), 2.35-2.45 (2H, m, PhCHCH*H* & NC*H*HCHN), 2.66-2.68 (4H, m, NCH_2CH_2), 3.00-3.09 (1H, m, NCH_2CHN), 3.16 (1H, dd, *J* = 8.7 & 6.6, NCH*H*CHN), 3.47 (2H, ABq, J_{AB} = 12.9, NCH_2Ph), 3.76 (1H, $_{apt}$t, $_{obs}J$ = 8.4, PhC*H*CH_2), 7.24-7.39 (8H, Ph*H*), 7.47-7.49 (2H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 23.26 (CH_2), 40.53 (CH_2), 53.07 (CH_2), 57.60 (CH_2), 58.34 (CH_2), 62.71 (CH), 68.07 (CH_2), 126.86 (CH), 127.23 (CH), 127.52 (CH), 128.18 (CH), 128.53 (CH), 128.63 (CH), 139.20 (C), 143.18 (C). High-resolution MS calcd for formula $C_{21}H_{27}N_2$: 307.2174; found: 307.2159.

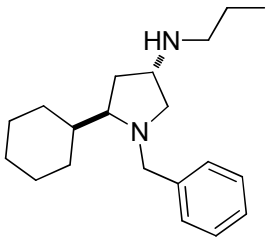
1.1.9.41 (8ka) (*cis*)-1-Benzyl-5-cyclohexyl-*N*-propylpyrrolidin-3-amine



General procedure F was used, **1k** (17 mg, 0.07 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1k**) = 17 mg, 82%. IR 3408, 2925, 2853, 1643, 1495, 1450, 1373, 1241; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.94 (3H, t, *J* = 7.5, Me), 1.05-1.26 (5H, m, NCHCHC*H*H, NCHCHCH_2C*H*H, NCHCHCH_2CH_2C*H*H), 1.72-1.90 (8H, m, NCHC*H*, NCHCHCH*H*, NCHCHCH_2CH*H*, NCHCHCH_2CH_2CH*H*, NHCH_2CH_2), 1.96-2.05 (1H, m, NCHC*H*HCH), 2.20-2.30 (1H, m, NCHCH*H*CH), 2.36-2.49 (2H, m, NC*H*CH_2CH, NC*H*HCHNH), 2.79-2.95 (2H, m, NHCH_2CH2), 3.10-3.14 (2H, m, NCH*H*CHNH), 3.59 (2H, ABq, J_{AB} = 13.2, NCH_2Ph), 3.71-3.78 (1H, m, NCH_2CHNH), 7.24-7.38 (5H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 11.42

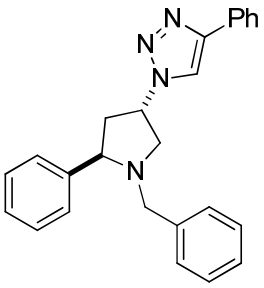
(CH_3), 20.20 (CH_2), 25.86 (CH_2), 26.12 (CH_2), 26.68 (CH_2), 26.71 (CH_2), 30.17 (CH_2), 30.80 (CH_2), 38.09 (CH), 46.84 (CH_2), 54.86 (CH), 55.62 (CH_2), 57.03 (CH_2), 67.45 (CH), 127.38 (CH), 128.51 (CH), 128.64 (CH), 137.95 (C). High-resolution MS calcd for formula $C_{20}H_{33}N_2$: 301.2643; found: 301.2643.

1.1.9.42 (8ka) (*trans*)-1-Benzyl-5-cyclohexyl-*N*-propylpyrrolidin-3-amine



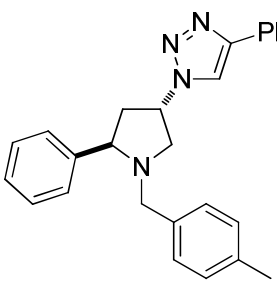
General procedure G was used, **1k** (67 mg, 0.27 mmol), flash chromatography ($CHCl_3$/MeOH = 9/1 Rf 0.4), yellow oil, yield (from **1k**) = 65 mg, 79%. IR 3376, 3027, 2923, 2851, 2792, 2505, 2422, 1586, 1494, 1451, 1375, 1326, 1147; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 0.93 (3H, t, *J* = 7.5, Me), 1.00-1.27 (5H, m, NCHCHC*H*H, NCHCHCH$_2$C*H*H, NCHCHCH$_2$CH$_2$C*H*H), 1.64-1.84 (8H, m, NCHC*H*, NCHCHCH*H*, NCHCHCH$_2$CH*H*, NCHCHCH$_2$CH$_2$CH*H*, NHCH$_2$C*H*$_2$), 1.97-2.19 (2H, m, NCHC*H*$_2$CH & NCHCH*H*CH), 2.32-2.41 (1H, m, NC*H*CH$_2$CH), 2.68-2.73 (2H, m, NHC*H*$_2$CH2), 2.76-2.83 (1H, m, NC*H*HCHNH), 3.17-3.25 (2H, m, NCH*H*CHNH), 3.35-3.41 (1H, m, NCH$_2$C*H*NH), 3.63 (2H, ABq, J_{AB} = 13.2, NC*H*$_2$Ph), 7.27-7.32 (5H, m, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 11.53 (CH_3), 21.25 (CH_2), 25.74 (CH_2), 26.28 (CH_2), 26.82 (CH_2), 26.92 (CH_2), 30.76 (CH_2), 39.11 (CH), 49.48 (CH_2), 55.44 (CH), 58.19 (CH_2), 66.98 (CH_2), 126.89 (CH), 128.27 (CH), 128.51 (CH), 139.53 (C). High-resolution MS calcd for formula $C_{20}H_{33}N_2$: 301.2643; found: 301.2630.

1.1.9.43 (9aa) 1-((*trans*)-1-Benzyl-5-phenylpyrrolidin-3-yl)-4-phenyl-1H-1,2,3-triazole



General procedure E was used, post-work up iodo-azetidine **2a** (71 mg, 0.19 mmol), DMSO (20 mL), sodium azide (25 mg, 0.38 mmol), ethynylbenzene (20 mg, 0.19 mmol), copper (I) iodide (36 mg, 0.19 mmol), flash chromatography (Hexane/EtOAc = 7/3 Rf 0.3), yellow oil, yield (from **1a**) = 52 mg, 65%. IR 3063, 3028, 2925, 2853, 1603, 1494, 1454, 1216, 1156; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 2.39 (1H, dt, *J* = 13.8 & 9.6, PhCHCH*H*), 2.61-2.69 (1H, m, PhCHC*H*H), 2.72 (1H, dd, *J* = 9.7 & 7.4, NC*H*HCHN$_3$), 3.49 (2H, ABq, J_{AB} = 12.9, NC*H*$_2$Ph), 3.61 (1H, dd, *J* = 9.7 & 7.4, NCH*H*CHN$_3$), 3.92 (1H, $_{apt}$t, $_{obs}J$ = 7.8, PhC*H*CH$_2$), 5.09-5.19 (1H, m, CH$_2$C*H*N$_3$), 7.17-7.28 (7H, m, Ph*H*), 7.31-7.38 (4H, m, Ph*H*), 7.46 (2H, d, *J* = 7.2, Ph*H*), 7.67 (1H, s, C*H*N$_3$), 7.75 (1H, d, *J* = 6.9, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 42.38 (CH_2), 57.11 (CH_2), 57.88 (CH), 59.44 (CH_2), 67.90 (CH), 118.68 (CH), 125.70 (CH), 127.17 (CH), 127.61 (CH), 127.76 (CH), 128.17 (CH), 128.33 (CH), 128.69 (CH), 128.77 (CH), 128.83 (CH), 130.58 (C), 138.42 (C), 141.68 (C), 147.81 (C). High-resolution MS calcd for formula $C_{25}H_{24}N_4Na$: 403.1899; found: 403.1917.

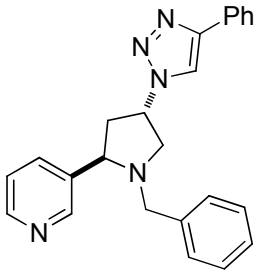
1.1.9.44 (9ca) (1-((*trans*)-1-(4-Methylbenzyl)-5-phenylpyrrolidin-3-yl)-4-phenyl-1H-1,2,3-triazole



General procedure D was used, post-work up iodo-azetidine **2c** (70 mg, 0.18 mmol) DMSO (20 mL), sodium azide (24 mg, 0.37 mmol), ethynylbenzene (18 mg, 0.18 mmol), copper (I) iodide (68 mg, 0.37 mmol), (Hexane/EtOAc = 7/3 Rf 0.3), yellow oil, yield (from **1c**) = 48 mg, 61%. IR 3356, 3070, 3026, 1674, 1600, 1523, 1493, 1456, 1341, 1170; ^{1}H NMR (δ;

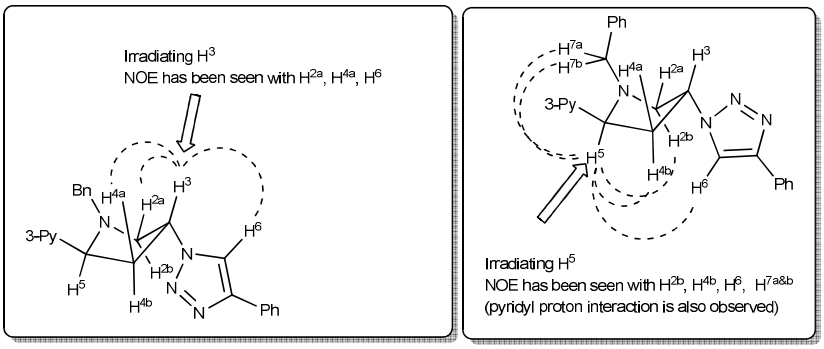
500 MHz, $CDCl_3$); 2.33 (3H, s, Me), 2.44 (1H, dt, *J* = 13.8 & 9.5, PhCHCH*H*), 2.69-2.74 (1H, m, PhCHC*H*H), 2.80 (1H, dd, *J* = 9.9 & 7.5, NC*H*HCHN$_3$), 3.53 (2H, ABq, J_{AB} = 13.0, NCH_2Ar), 3.69 (1H, dd, *J* = 9.9 & 7.5, NCH*H*CHN$_3$), 3.97 (1H, $_{apt}$t, $_{obs}J$ = 8.0, PhC*H*CH$_2$), 5.17-5.23 (1H, m, CH$_2$C*H*N$_3$), 7.11 (2H, d, *J* = 8.0, Ar*H*), 7.15 (2H, d, *J* = 8.0, Ar*H*), 7.30-7.34 (2H, m, Ar*H*), 7.39-7.44 (4H, m, Ar*H*), 7.52 (2H, d, *J* = 7.0, Ar*H*), 7.71 (1H, s, C*H*N$_3$), 7.81 (1H, d, *J* = 7.0, Ar*H*); $^{13}C\{^1H\}$ NMR (δ; 125 MHz, $CDCl_3$), 21.08 (CH_3), 42.49 (CH_2), 56.65 (CH_2), 57.94 (CH), 59.23 (CH_2), 67.76 (CH), 118.61 (CH), 125.69 (CH), 127.59 (CH), 127.70 (CH), 128.14 (CH), 128.69 (CH), 128.74 (CH), 128.82 (CH), 129.00 (CH), 130.68 (C), 135.19 (C), 136.80 (C), 141.63 (C), 147.90 (C). High-resolution MS calcd for formula $C_{26}H_{26}N_4Na$: 417.2055; found: 417.2054.

1.1.9.45 (9da) 3-(*trans*-1-Benzyl-4-(4-phenyl-1H-1,2,3-triazol-1-yl)pyrrolidin-2-yl)pyridine.



General procedure D was used, post-work up iodo-azetidine **2d** 110 mg, 0.30 mmol), DMSO (20 mL), sodium azide (30 mg, 0.45 mmol), ethynylbenzene (32 mg, 0.30 mmol), copper (I) iodide (115 mg, 0.60 mmol), (EtOAc Rf 0.4), yellow oil, yield (from **1d**) = 86 mg, 57%. IR 3127, 3026, 2920, 2822, 1579, 1495, 1481, 1455, 1428, 1375, 1322, 1289, 1229, 1178, 1160; ^1H NMR (δ; 300 MHz, $CDCl_3$); 2.43(1H, dt, *J* = 15.0 & 9.0, PyCHCH*H*), 2.78 (1H, m, PyCHC*H*H), 2.86 (1H, dd, *J* = 9.0 & 6.0, CH*H*N$_3$), 3.57 (2H, ABq, J_{AB} = 15.0, NCH_2Ph), 3.71 (1H, t, *J* = 9.0, C*H*HN$_3$), 4.07 (1H, t, *J* = 9.0, PyC*H*CH$_2$), 5.21 (1H, m, NC*H*CH$_2$N$_3$), 7.33 (9H, m, Ar*H*), 7.75 (1H, s, C*H*N$_3$), 7.81 (2H, d, *J* = 9.0, Ar*H*), 7.87 (1H, d, *J* = 6.0, Ar*H*), 8.61 (1H, br, Py*H*), 8.78 (1H, br, Py*H*); $^{13}C\{^1H\}$ NMR (δ; 100 MHz, $CDCl_3$), 42.30 (CH_2), 56.20 (CH_2), 57.82 (CH), 59.42 (CH_2), 65.45 (CH), 118.87 (CH), 125.71(CH), 127.36 (CH), 128.25 (CH), 128.45 (CH), 128.65 (CH), 128.87 (CH), 130.47 (C), 135.15 (CH), 137.93(C), 147.87(C), 149.29(CH), 149.57(CH) (quat C=$\underline{C}_{triazole}$ not observed). High-resolution MS calcd for formula $C_{24}H_{23}N_5Na$: 404.1851; found: 404.1867.

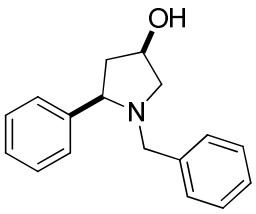
nOe experiments revealed *trans* substitution arrangement about the pyrrolidine ring, suggesting compound **3d**, formed *in situ* is cleanly converted *via* an S_N2 mechanism to the corresponding azide which is subsequently converted to the corresponding triazole:



That H^3 and H^5 display nOe between different protons on the same methylene carbons (corresponding to $H^{2a\&b}$ and $H^{4a\&b}$) is convincing evidence of *trans* geometry. Also, no nOe between H^3 and H^5 was observed.

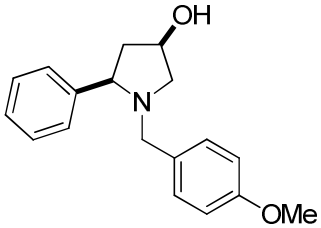
trans-**9da**

1.1.9.46 (10a) (*cis*)-1-Benzyl-5-phenylpyrrolidin-3-ol



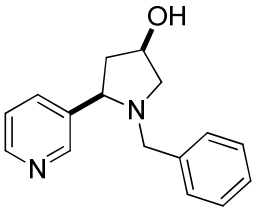
General procedure H was used, **1a** (100 mg, 0.42 mmol), flash chromatography (Hexane/EtOAc = 2/1 Rf 0.3), yellow oil, yield (from **1a**) = 87 mg, 82%. IR 3370, 2970, 2906, 2794, 1493, 1453, 1408, 1376, 1250, 1229, 1144; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.71-1.79 (1H, m, PhCHC*H*H), 2.09 (1H, br, OH), 2.33 (1H, dd, *J* = 10.3 & 4.8, NCH*H*CHOH), 2.61-2.70 (1H, m, PhCHCH*H*), 3.02-3.07 (1H, m, NC*H*HCHOH), 3.36 (1H, $_{apt}$t, $_{obs}J$ = 8.4, PhC*H*CH_2), 3.45 (2H, ABq, J_{AB} = 13.2, NCH_2Ph), 4.20-4.29 (1H, m, CH_2C*H*OH), 7.22-7.31 (6H, m, Ph*H*), 7.34-7.39 (2H, m, Ph*H*), 7.47 (2H, d, *J* = 6.9, Ph*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 45.97 (CH_2), 57.16 (CH_2), 62.13 (CH_2), 68.28 (CH), 70.12 (CH), 126.90 (CH), 127.29 (CH), 127.55 (CH), 128.20 (CH), 128.62 (CH), 128.67 (CH), 138.83 (C), 142.84 (C). High-resolution MS calcd for formula $C_{17}H_{19}NONa$: 276.1364; found: 276.1373.

1.1.9.47 (10b) (*cis*)-1-(4-Methoxybenzyl)-5-phenylpyrrolidin-3-ol



General procedure H was used, **1b** (100 mg, 0.37 mmol), flash chromatography (Hexane/EtOAc = 2/1 Rf 0.3), yellow oil, yield (from **1b**) = 83 mg, 79%. IR 3346, 2925, 1682, 1611, 1512, 1454, 1302, 1248, 1178, 1106; ^{1}H NMR (δ; 500 MHz, $CDCl_3$); 1.72-1.77 (1H, m, PhCHC*H*H), 2.11 (1H, br, OH), 2.33 (1H, dd, *J* = 10.5 & 5.0, NCH*H*CHOH), 2.59-2.67 (1H, m, PhCHCH*H*), 2.99-3.03 (1H, m, NC*H*HCHOH), 3.34 (1H, $_{apt}$t, $_{obs}J$ = 8.5, PhC*H*CH_2), 3.40 (2H, ABq, J_{AB} = 13.0, NCH_2Ph), 3.78 (3H, s, OMe), 4.23-4.25 (1H, m, CH_2C*H*OH), 6.82 (2H, d, *J* = 8.5, Ar*H*), 7.15 (2H, d, *J* = 8.5, Ar*H*), 7.27 (1H, t, *J* = 7.5, Ph*H*), 7.36 (2H, t, *J* = 7.5, Ph*H*), 7.46 (2H, d, *J* = 7.5, Ph*H*); ^{13}C{^{1}H} NMR (δ; 125 MHz, $CDCl_3$), 45.90 (CH_2), 55.19 (CH_3), 56.29 (CH_2), 61.89 (CH_2), 68.17 (CH), 69.95 (CH), 113.53 (CH), 127.26 (CH), 127.60 (CH), 128.56 (CH), 129.92 (CH), 130.61 (C), 142.63 (C), 158.61 (C). High-resolution MS calcd for formula $C_{18}H_{21}NO_2Na$: 306.1470; found: 306.1464.

1.1.9.48 (10d) (*cis*)-1-Benzyl-5-(pyridin-3-yl)pyrrolidin-3-ol



General procedure H was used, **1d** (100 mg, 0.42 mmol), flash chromatography (EtOAc Rf 0.4), yellow oil, yield (from **1d**) = 77 mg, 72%. IR 3298, 3028, 2925, 2793, 1579, 1495, 1480, 1453, 1428, 1373, 1318, 1217, 1149; ^{1}H NMR (δ; 300 MHz, $CDCl_3$); 1.68-1.75 (1H, m, PyCHC*H*H), 2.20 (1H, br, OH), 2.36 (1H, dd, *J* = 10.5 & 4.8, NCH*H*CHOH), 2.58-2.68 (1H, m, PyCHCH*H*), 3.01-3.10 (1H, m, NC*H*HCHOH), 3.42 (2H, ABq, J_{AB} = 13.2, NCH_2Ph), 3.39 (1H, $_{apt}$t, $_{obs}J$ = 8.4, PyC*H*CH_2), 3.42 (2H, ABq, J_{AB} = 13.2, NCH_2Ph), 4.23-4.28 (1H, m, CH_2C*H*OH), 7.13-7.27 (6H, m, Ar*H*), 7.84 (1H, d, *J* = 8.1, Py*H*), 8.46 (1H, d, *J* = 3.6, Py*H*), 8.57 (1H, s, Py*H*); ^{13}C{^{1}H} NMR (δ; 100 MHz, $CDCl_3$), 45.86 (CH_2), 57.20 (CH_2), 62.38 (CH_2), 66.08 (CH), 70.02 (CH), 124.02 (CH), 127.47 (CH), 128.34 (CH), 128.75 (CH), 135.36 (CH), 137.83 (C), 138.02(C), 148.92 (CH), 149.60 (CH). High-resolution MS calcd for formula $C_{16}H_{18}N_2ONa$: 277.1317; found: 277.1323.

2 General Biological Procedures

2.1 Zebrafish maintenance and embryo collection

Wild-type AB* zebrafish were maintained and used according to animal experimentation licencing requirements of the Scientific Procedures Act 1986 (UK) in a Tecniplast flow-through system under standard conditions with a 14/10 hour light/dark cycle. Motility experiments with 6 dpf zebrafish larvae were carried out in the laboratory of Biotecont Ltd. in accordance with Hungarian law for animal experimentation. Breeding pairs were set up in breeding cages the day before collection of embryos. Embryos were obtained from crosses the following morning and then transferred immediately to E3 embryo medium. E3 embryo medium was changed daily and the embryos were kept at 28 ºC for the duration of the investigation.

2.2 Assay preparation

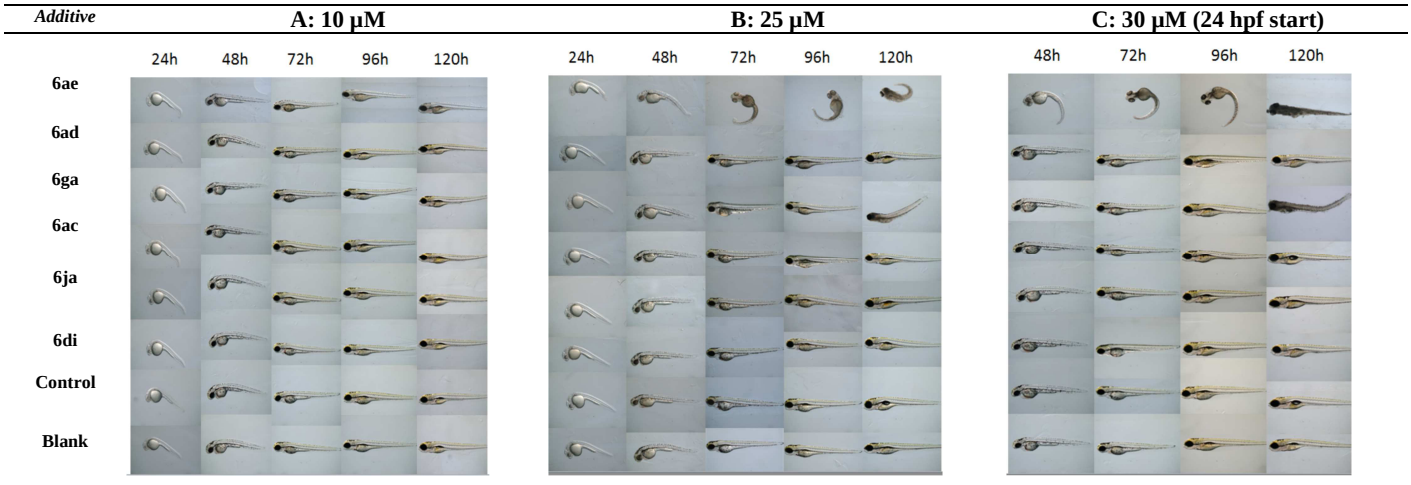
Assays were carried out in 24 well plates with ten embryos per well and three wells used per compound/control (0.1% DMSO and E3 medium control). One well per treatment group was used for scoring morphological defects. Drug dilutions were made up fresh on the day of treatment by dissolving in E3 embryo medium. Sample dilutions were kept in the dark to avoid possible photodegradation. A total volume of 1.5 mL of solution was added to each well. The plates were maintained at 28 °C, sealed and covered in kitchen foil to avoid light contamination. Treatments with 10 and 25 μM concentrations of each azetidine were started at the 75%-epiboly stage and treatments with a 30 μM concentration of each azetidine were started at the prim-5 stage. Embryos were staged based on the staging series outlined by Kimmel *et al.*.[1]

Embryos were observed daily over five days and morphological abnormalities were scored. Each of the assays was carried out in triplicate and medium was not renewed in any of the wells over the 5 day period.

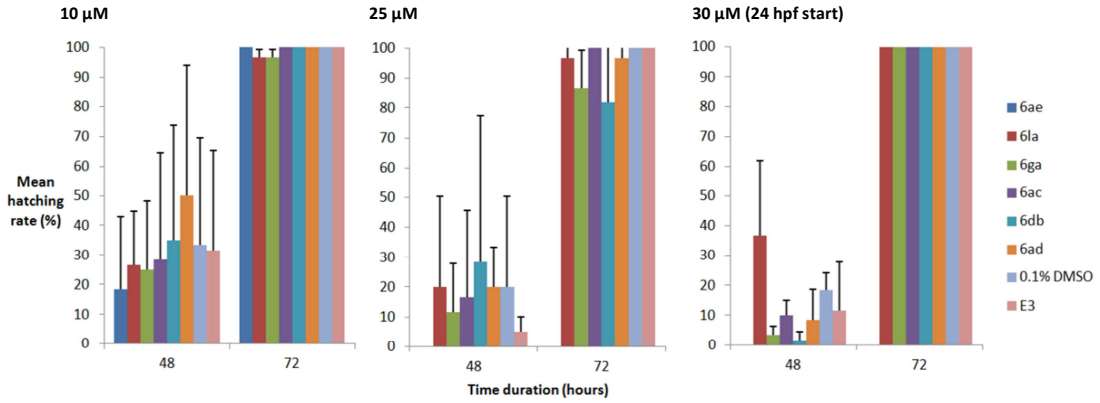
Two-tailed T-test and One-way ANOVA analysis were carried out to determine whether any of the morphological effects observed were statistically significant. Motility assays with compound *cis*-**6ae** were carried out in the laboratory of Biotecont Ltd. in accordance with Hungarian law for animal experimentation. To determine the effect on motility compound *cis*-**6ae** was administered to 6 dpf zebrafish for 30 minutes to assess the distance moved. The assays were carried out in a four well plate with two wells per compound and two wells per control (0.1% DMSO) with the total volume in each well totalling 20 mL. Fish were acclimatized to the recording plate for 30 minutes before the plate was inserted into an imaging device that took pictures every second. These images were then processed using a custom-made program (KomiPL) to determine the pixel changes over the 30 minute time period, indicating the extent of movement of the larvae, thus permitting comparisons between the treated and control samples. Two tailed T-tests and One-way ANOVA analysis were then used to determine whether any differences observed were significant. Further analysis of compound **6ae** using fluorescence analysis of *Tg(fli1:EGFP)*[2] and *Tg(gata1a:RFP;fli:EGF)*[2] zebrafish transgenic lines[3] was carried out using a Nikon fluorescence microscope SMZ1500. Frequency of zebrafish embryos and larvae exhibiting blood clots and tail necrosis were recorded following treatment at 75%-epiboly with 50 µM of compound **6ae** for 24 hours. T-tests were performed to determine whether these differences were significant.

3 Biological Supplementary Figures and Tables

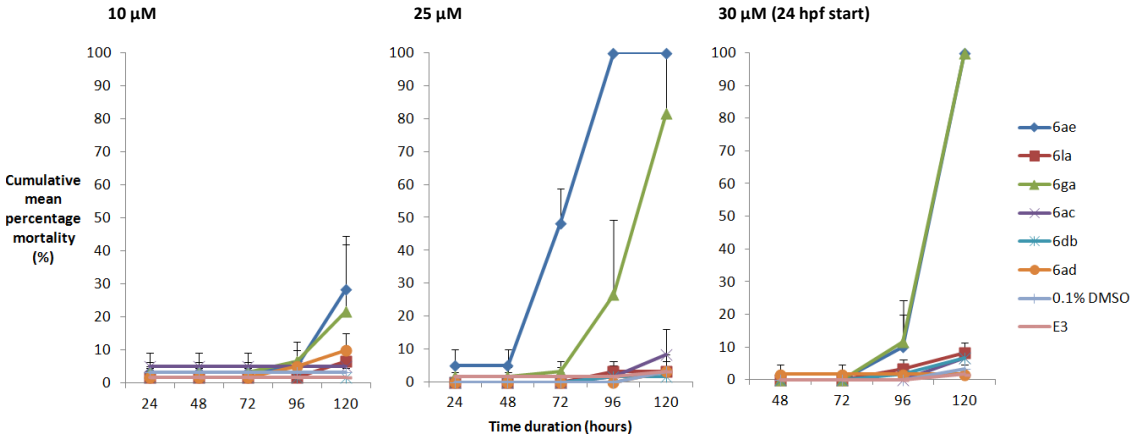
Supplementary Table 1. Table S01 - Observation of zebrafish treated with DMSO solutions of chosen azetidines over 5 days: A) 10 µM, B) 25 µM and C) 30 µM (24 hpf start)



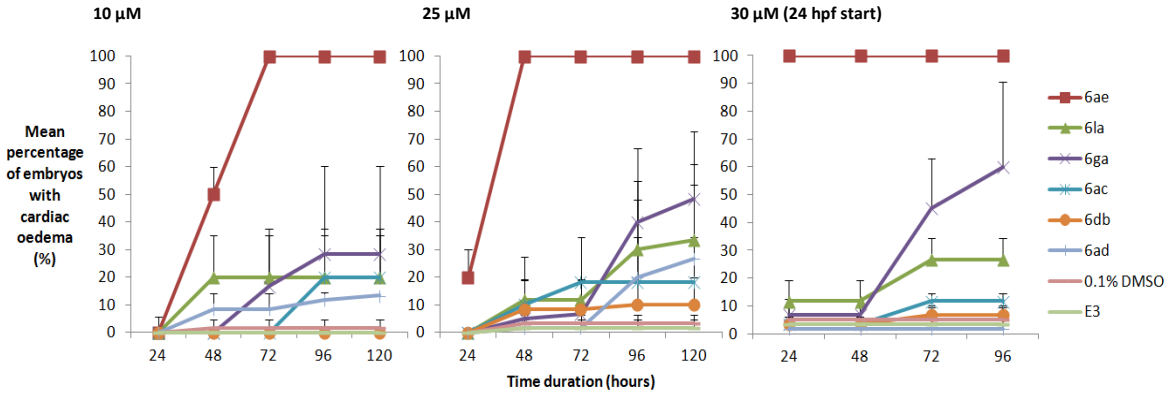
***Control**: DMSO added (0.1%). **Blank**: No additive.*



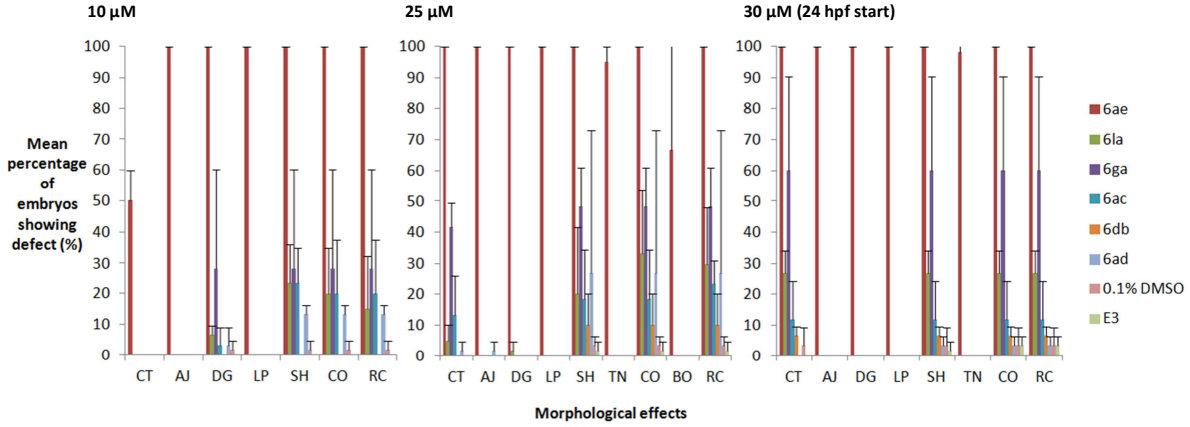
Supplementary Figure 1. Mean hatching rates of embryos after 48 and 72 hours following treatment with azetidines at 10 µM, 25 µM and 30 µM (24 hpf start). Treatment with 6ae at both 25 and 30 µM was found to significantly affect the hatching rate of embryos compared to controls (p=<0.05, n=60).



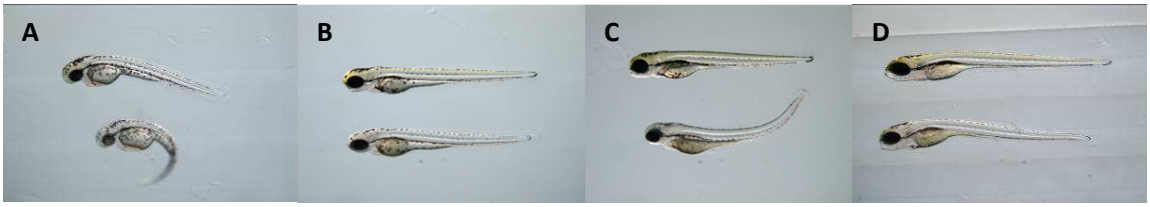
Supplementary Figure 2. Cumulative mean mortality rates for embryos over a 5 day period following treatment with azetidines at 10 µM, 25 µM and 30 µM (24 hpf start). **6ae** was found to cause significant embryo mortality in all three experiments (p=<0.05, n=60). **6ga** was found to cause significant embryo mortality at 25 and 30 µM (p=<0.05, n=60).



Supplementary Figure 3. Mean percentage of embryos presenting with cardiac oedema over the 5 day period following treatment with azetidines at 10 µM, 25 µM and 30 µM (24 hpf start). The development of cardiac oedema with **6ae**, **6la** and **6ga** was found to be significant in all three experiments (p=<0.05, n=60).

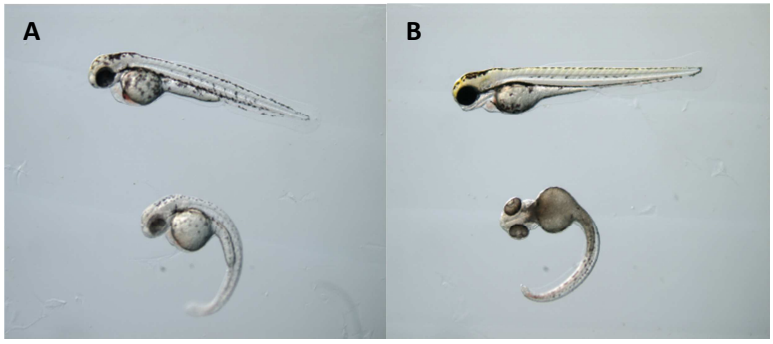


Supplementary Figure 4. Mean percentage of embryos showing morphological defects (CT = Curved tail, AJ = Abnormal jaw, DG = Delayed growth, LP = Lack of pigmentation, SH = Slowed heart rate, TN = Tail necrosis, CO = Cardiac oedema, RC = Reduced circulation in tail/blood clots) over the 5 day period following treatment with azetidines at 10 µM, 25 µM and 30 µM (24 hpf start). **6ae**, **6ga** and **6la** were found to cause significant morphological defects in all three experiments (p=<0.05, n=60). 6ae was found to cause cardiac oedema, reduced circulation/blood clots, delayed growth, curved tails and also affected pigment formation in the embryo. **6ga** was found to cause cardiac oedema, a decrease in heart rate (bradycardia), reduced circulation and curved tails. **6la** was found to cause cardiac oedema, reduced circulation and curved tails.

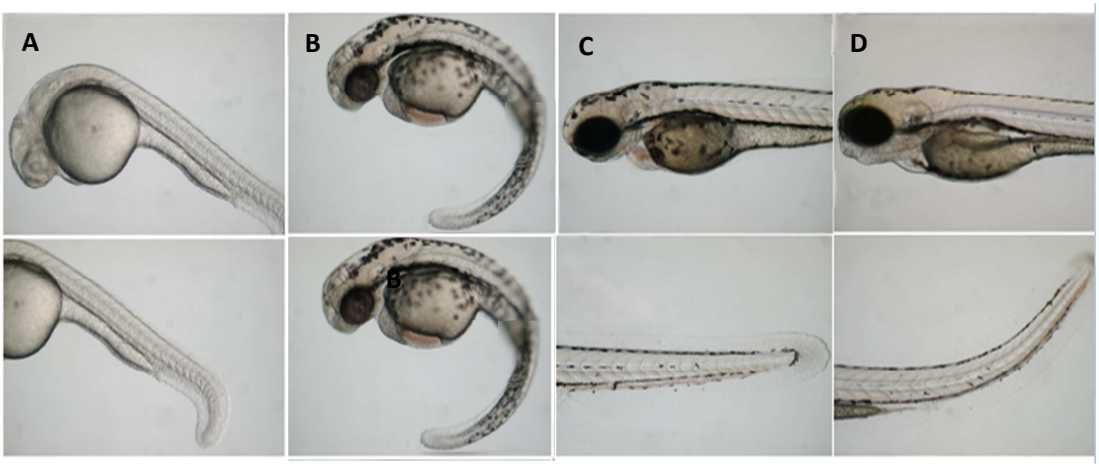


Supplementary Figure 5. Comparison between wild-type (top) and 10 µM **6ae**-treated zebrafish (below) over 24 (A), 48 (B), 72 (C) and 96 (D) hours.

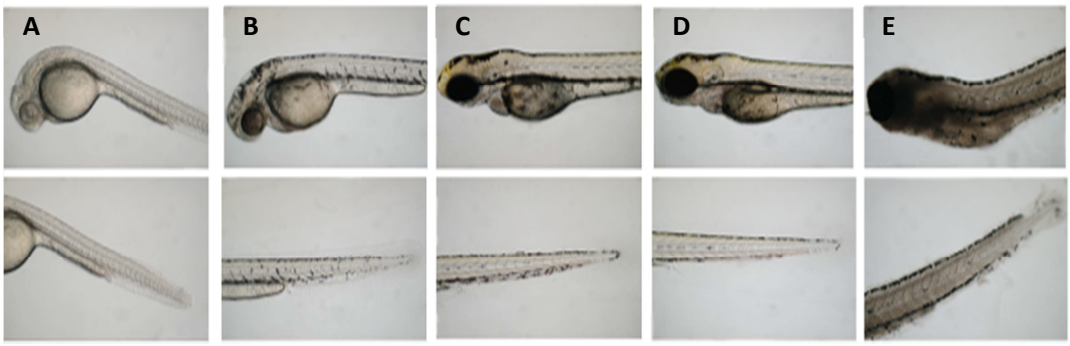
Supplementary Figure 6. Comparison between wild-type (top) and 25 µM **6ae**-treated zebrafish (below) over 72 hours.



Supplementary Figure 7. Comparison between wild-type (top) and 30 µM **6ae**-treated zebrafish (below) over 24 (A) and 48 (B) hours. Treatment was initially started at 24 hpf.



Supplementary Figure 8. Compound **6ae** at a concentration of 10 µM reduces circulation, especially in the tail (front part of body shown above, tail shown below). A = after 24 hours, B = after 48 hours, C = after 72 hours and D = after 96 hours.



Supplementary Figure 9. Compound **6ga** at a concentration of 25 µM significantly reduces circulation in the body of the zebrafish embryo, eventually leading to death. A = after 24 hours, B = after 48 hours, C = after 72 hours, D = after 96 hours and E = after 120 hours.

4 Biological Experiments' Statistics

Supplementary Table 2. AVOVA analysis to compare effect of compounds on locomotion after 5 minutes.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	4731.553	946.3106	26058.43
Column 2	5	2924.792	584.9584	3213.904
Column 3	5	4117.128	823.4256	194863
Column 4	5	6581.532	1316.306	12340.35
Column 5	5	9523.086	1904.617	13501.81
Column 6	5	4320.859	864.1718	163239.9
Column 7	5	3221.763	644.3526	331.6527
Column 8	5	3767.235	753.4471	6625.596
Column 9	5	3558.136	711.6272	4545.341
Column 10	5	6354.075	1270.815	26061.02
Column 11	5	6944.029	1388.806	34869.36
Column 12	5	5212.633	1042.527	17855.74
Column 13	5	4382.084	876.4168	137000.4
Column 14	5	6975.531	1395.106	48822.53
Column 15	5	3188.939	637.7878	18232.89
Column 16	5	7700.425	1540.085	17018.86
Column 17	5	7282.561	1456.512	8530.194
Column 18	5	7393.691	1478.738	55276.46

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	12615361	17	742080	16.94274	1.04E-18	1.766577
Within Groups	3153550	72	43799.3			
Total	15768910	89				

Supplementary Table 3. T-test values comparing effect of compounds on locomotion after 5 minutes.

Compound	P-value
6ga	0.001562387
6la	1.03618E-07
6ae	0.000926626

Supplementary Table 4. AVOVA analysis to compare effect of compounds on locomotion after 10 minutes

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	5087.526	1017.505	3823.026
Column 2	5	2557.956	511.5913	3418.446

Column 3	5	3127.262	625.4524	9232.09
Column 4	5	6806.529	1361.306	2826.408
Column 5	5	8394.006	1678.801	21997.09
Column 6	5	4730.401	946.0801	9638.387
Column 7	5	2842.601	568.5202	9045.496
Column 8	5	3312.753	662.5505	10215.38
Column 9	5	2815.17	563.034	12074.41
Column 10	5	7668.895	1533.779	23916.73
Column 11	5	7600.391	1520.078	41747.7
Column 12	5	5190.377	1038.075	5320.072
Column 13	5	2334.998	466.9996	1927.142
Column 14	5	5201.687	1040.337	7733.223
Column 15	5	4201.29	840.2581	13459.91
Column 16	5	6829.386	1365.877	5158.632
Column 17	5	7694.122	1538.824	5652.248
Column 18	5	6539.336	1307.867	40748.17

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	14161341	17	833020.1	65.78362	6.71E-37	1.766577
Within Groups	911738.3	72	12663.03			
Total	15073080	89				

Supplementary Table 5. T-test to compare effect of compounds on locomotion after 10 minutes

Compound	P-value
6ga	8.05696E-05
6la	7.68395E-08
6ae	8.09969E-08

Supplementary Table 6. ANOVA analysis to compare effect of compounds on locomotion after 15 minutes

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	3943.517	788.7033	24424.51
Column 2	5	2742.699	548.5398	3867.392
Column 3	5	3003.618	600.7237	10559.78
Column 4	5	5883.761	1176.752	13111.51
Column 5	5	7999.098	1599.82	32048.96

Column 6	5	5037.557	1007.511	11922.18
Column 7	5	2500.799	500.1598	252.6256
Column 8	5	2864.137	572.8275	11715.66
Column 9	5	2594.157	518.8315	9488.219
Column 10	5	7059.796	1411.959	7123.291
Column 11	5	7471.976	1494.395	27882.91
Column 12	5	4880.966	976.1932	6817.499
Column 13	5	2666.017	533.2033	1584.076
Column 14	5	3563.475	712.695	19402.96
Column 15	5	4663.403	932.6805	40985.21
Column 16	5	6707.498	1341.5	1962.81
Column 17	5	8042.989	1608.598	4256.939
Column 18	5	7139.165	1427.833	5769.613

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	14245736	17	837984.4	64.68809	1.17E-36	1.766577
Within Groups	932704.6	72	12954.23			
Total	15178440	89				

Supplementary Table 7. T-test to compare effect of compounds on locomotion after 15 minutes

Compound	P-value
6ga	5.55467E-06
6la	1.22182E-08
6ae	9.63743E-09

Supplementary Table 8. ANOVA analysis to compare effect of compounds on locomotion after 20 minutes

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	3325.954	665.1908	25692.14
Column 2	5	2733.736	546.7471	1933.023
Column 3	5	3554.359	710.8718	26440.76
Column 4	5	5106.53	1021.306	10222.19
Column 5	5	6458.187	1291.637	16066.96
Column 6	5	4277.741	855.5481	9006.125
Column 7	5	2254.736	450.9472	4921.299
Column 8	5	3782.166	756.4332	3891.617

Column 9	5	3575.545	715.1089	11734.96
Column 10	5	6468.666	1293.733	12226.79
Column 11	5	7117.596	1423.519	4600.962
Column 12	5	4954.26	990.8521	13971.44
Column 13	5	2529.859	505.9718	1808.458
Column 14	5	5476.584	1095.317	83197.31
Column 15	5	5915.696	1183.139	6687.981
Column 16	5	6320.733	1264.147	4608.758
Column 17	5	8185.965	1637.193	9153.627
Column 18	5	6568.136	1313.627	18696.7

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	10358526	17	609325.1	41.40982	2.54E-30	1.766577
Within Groups	1059444	72	14714.51			
Total	11417970	89				

Supplementary Table 9. T-test to compare effect of compounds on locomotion after 20 minutes

Compound	P-value
6ga	0.00010489
6la	5.32534E-07
6ae	0.000101036

Supplementary Table 10. ANOVA analysis to compare effect of compounds on locomotion after 25 minutes

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	5670.722	1134.144	7432.314
Column 2	5	2885.337	577.0673	8707.398
Column 3	5	5929.288	1185.858	72844.71
Column 4	5	6471.03	1294.206	1823.998
Column 5	5	6787.917	1357.583	6068.615
Column 6	5	4613.897	922.7794	158747
Column 7	5	2788.424	557.6848	6458.469
Column 8	5	5331.315	1066.263	13521.33
Column 9	5	4539.873	907.9746	10835.21
Column 10	5	5626.256	1125.251	8120.02
Column 11	5	7241.857	1448.371	17924.8
Column 12	5	4592.249	918.4498	2336.048
Column 13	5	3165.711	633.1421	5288.223
Column 14	5	2985.782	597.1563	1797.029
Column 15	5	5722.381	1144.476	1148.85
Column 16	5	7718.992	1543.798	5986.916
Column 17	5	7266.606	1453.321	60040.47
Column 18	5	5717.213	1143.443	6206.456

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	8332129	17	490125.2	22.31856	4.31E-22	1.766577
Within Groups	1581151	72	21960.44			
Total	9913280	89				

Supplementary Table 11. T-test to compare effect of compounds on locomotion after 25 minutes

Compound	P-value
6ga	0.077721
6la	0.000407
6ae	0.000198

Supplementary Table 12. ANOVA analysis to compare effect of compounds on locomotion after 30 minutes

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
Column 1	5	5677.555	1135.511	598.3083
Column 2	5	2836.498	567.2996	1367.249
Column 3	5	3547.911	709.5822	32855.83
Column 4	5	6586.844	1317.369	651.4095
Column 5	5	6628.785	1325.757	26654.26
Column 6	5	4474.232	894.8464	4454.129
Column 7	5	2973.415	594.6829	61.72641
Column 8	5	3409.743	681.9486	14323.01
Column 9	5	4788.805	957.7609	8359.459
Column 10	5	6742.466	1348.493	191.7352
Column 11	5	6812.204	1362.441	29276.56
Column 12	5	4089.28	817.8559	2271.681
Column 13	5	2630.894	526.1787	2284.029
Column 14	5	3085.926	617.1853	4523.023
Column 15	5	5815.097	1163.019	1514.701
Column 16	5	7211.106	1442.221	7493.19
Column 17	5	7904.241	1580.848	18384.26
Column 18	5	5352.685	1070.537	33396.45

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	9979379	17	587022.3	56.00734	1.39E-34	1.766577
Within Groups	754644.1	72	10481.17			
Total	10734023	89				

Supplementary Table 13. T-test to compare effect of compounds on locomotion after 30 minutes.

Compound	P-value
6ga	0.000391
6la	0.002055
6ae	0.000599

Supplementary Table 14. T-test comparing occurrence of mortalities with azetidines at 10 μM to controls.

Comparison made	P value
6ae and DMSO	0.118786
6ae and E3	0.043728
6la and DMSO	0.526294
6la and E3	0.344021
6ga and DMSO	0.163601
6ga and E3	0.057505
6ac and DMSO	0.013219
6ac and E3	1.25E-05
6db and DMSO	0.071854
6db and E3	1
6ad and DMSO	0.629964
6ad and E3	0.099281

Supplementary Table 15. T-test comparing occurrence of morphological effects with azetidines at 10 μM to controls.

Comparison made	P value
6ae and DMSO	4.8715E-43
6ae and E3	1.63589E-43
6la and DMSO	0.000777081
6la and E3	9.18407E-05
6ga and DMSO	0.004599777
6ga and E3	0.002042237
6ac and DMSO	0.005840775
6ac and E3	0.00109187
6db and DMSO	0.004889474
6db and E3	1
6ad and DMSO	0.00204198
6ad and E3	5.20755E-05

Supplementary Table 16. Table 15 – T-test comparing occurrence of cardiac oedema with azetidines at 10 μM to controls.

Comparison	P value (stage)				
	24h	48h	72h	96h	120h
6ae and DMSO	1	0.001297	4.9421E-07	4.9421E-07	4.9421E-07
6la and DMSO	1	0.106166	0.10616646	0.10616646	0.106166461
6ga and DMSO	1	0.373901	0.28399843	0.22103575	0.221035754
6ac and DMSO	1	0.373901	0.37390097	0.14481833	0.144818327
6db and DMSO	1	0.373901	0.37390097	0.37390097	0.373900966
6ad and DMSO	1	0.148148	0.14814815	0.05504061	0.007762603

Supplementary Table 17. T-test comparing occurrence of mortalites with azetidines at 25 μM to controls

Comparison made	P value
6ae and DMSO	0.000122
6ae and E3	0.000169
6la and DMSO	0.378718
6la and E3	0.456005
6ga and DMSO	0.020576
6ga and E3	0.028789
6ac and DMSO	0.329236
6ac and E3	1
6db and DMSO	1
6db and E3	0.105402
6ad and DMSO	1
6ad and E3	0.105402

Supplementary Table 18. T-test comparing occurrence of morphological effects with azetidines at 25 μM to controls

Comparison made	P value
6ae and DMSO	1.6029E-66
6ae and E3	1.00529E-66
6la and DMSO	0.000143439
6la and E3	8.71181E-05
6ga and DMSO	2.87154E-06
6ga and E3	1.92843E-06
6ac and DMSO	0.000710127
6ac and E3	0.000346351
6db and DMSO	0.042053839
6db and E3	0.001809474
6ad and DMSO	0.024197027
6ad and E3	0.018145042

Supplementary Table 19. T-test comparing occurrence of cardiac oedema with azetidines at 25 μM to controls.

Comparison	P value (stage)				
	24h	48h	72h	96h	120h
6ae and DMSO	0.025721	5.29E-07	5.2915E-07	5.2915E-07	5.29E-07
6la and DMSO	1	0.151835	0.15183454	0.064676894	0.063603
6ga and DMSO	1	0.64333	0.42164826	0.075475876	0.003795
6ac and DMSO	1	0.546715	0.1868218	0.186821797	0.186822
6db and DMSO	1	0.467605	0.46760475	0.329460331	0.32946
6ad and DMSO	1	0.518519	0.51851852	0.452973501	0.431794

Supplementary Table 20. T-test comparing occurrence of mortalties with azetidines at 30 μM (24hpf start) to controls

Comparison made	P value
6ae and DMSO	0.048523213
6ae and E3	0.045087791
6la and DMSO	0.155312928
6la and E3	0.05220515
6ga and DMSO	0.045163937
6ga and E3	0.041935296
6ac and DMSO	0.557465885
6ac and E3	0.308260937
6db and DMSO	0.337552599
6db and E3	0.127088903
6ad and DMSO	0.454803931
6ad and E3	0.14341993

Supplementary Table 21. T-test comparing occurrence of morphological effects with azetidines at 30 μM (24hpf start) to controls

Comparison made	P value
6ae and DMSO	2.88807E-55
6ae and E3	4.76653E-56
6la and DMSO	0.000190434
6la and E3	2.74065E-05
6ga and DMSO	6.0095E-05
6ga and E3	2.89799E-05
6ac and DMSO	0.072122322
6ac and E3	0.010858398
6db and DMSO	0.785217517
6db and E3	0.076822944
6ad and DMSO	0.345392337
6ad and E3	0.636549591

Supplementary Table 22. T-test comparing occurrence of cardiac oedema with azetidines at 30 μM (24hpf start) to controls.

Comparison	P value (stage)			
	48h	72h	96h	120h
6ae and DMSO	5.08E-06	5.08E-06	5.08E-06	5.08E-06
6la and DMSO	0.274577	0.274577	0.014721	0.014721
6ga and DMSO	0.724659	0.724659	0.020776	0.036548
6ac and DMSO	0.724659	0.724659	0.441823	0.441823
6db and DMSO	0.64333	0.64333	0.64333	0.64333
6ad and DMSO	0.373901	0.373901	0.373901	0.373901

Supplementary Table 23. ANOVA analysis comparing morphological effects with azetidines at 10 μM to controls

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
6ae	12	1135	94.58333	352.0833
	12	1140	95	300
	12	1135	94.58333	352.0833
6la	12	70	5.833333	67.42424
	12	145	12.08333	211.1742
	12	40	3.333333	10.60606
6ga	12	50	4.166667	26.51515
	12	50	4.166667	26.51515
	12	325	27.08333	1120.265
6ac	12	90	7.5	184.0909
	12	90	7.5	184.0909
	12	50	4.166667	26.51515
6db	12	0	0	0
	12	0	0	0
	12	0	0	0
6ad	12	45	3.75	46.02273
	12	70	5.833333	26.51515
	12	45	3.75	46.02273
0.1% DMSO	12	0	0	0
	12	35	2.916667	6.628788
	12	0	0	0
E3	12	0	0	0
	12	0	0	0
	12	0	0	0

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	266140.9	23	11571.34	92.98754	1.8E-112	1.570294
Within Groups	32852.08	264	124.4397			
Total	298993	287				

Supplementary Table 24. ANOVA analysis comparing morphological effects with azetidines at 25 μM to controls.

Anova: Single Factor

SUMMARY

Groups	*Count*	*Sum*	*Average*	*Variance*
6ae	19	1820	95.78947	170.1754
	19	1820	95.78947	259.0643
	19	1740	91.57895	600.1462
6la	19	60	3.157895	22.80702
	19	180	9.473684	255.2632
	19	260	13.68421	432.8947
6ga	19	245	12.89474	300.8772
	19	320	16.84211	678.3626
	19	300	15.78947	570.1754
6ac	19	60	3.157895	39.47368
	19	120	6.315789	157.8947
	19	125	6.578947	127.924
6db	19	0	0	0
	19	80	4.210526	70.17544
	19	40	2.105263	17.54386
6ad	19	285	15	841.6667
	19	60	3.157895	56.14035
	19	0	0	0
0.1% DMSO	19	0	0	0
	19	15	0.789474	3.508772
	19	15	0.789474	3.508772
E3	19	0	0	0
	19	0	0	0
	19	15	0.789474	3.508772

ANOVA

Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	408113.2	23	17744.05	92.35458	8.7E-151	1.554323
Within Groups	83000	432	192.1296			
Total	491113.2	455				

Supplementary Table 25. ANOVA analysis comparing morphological effects with azetidines at 30 μM (24hpf start) to controls.

Anova: Single Factor

SUMMARY

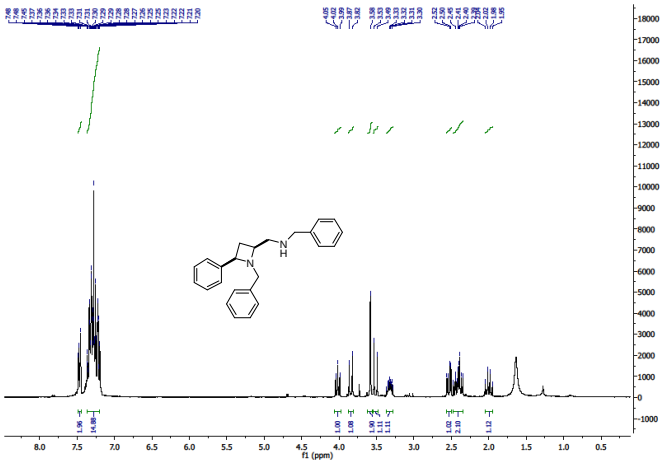
Groups	*Count*	*Sum*	*Average*	*Variance*
6ae	18	1700	94.44444	499.6732
	18	1710	95	450
	18	1705	94.72222	501.3889
6la	18	150	8.333333	147.0588
	18	210	11.66667	288.2353
	18	120	6.666667	94.11765
6ga	18	150	8.333333	147.0588
	18	480	26.66667	1505.882
	18	450	25	1323.529
6ac	18	150	8.333333	147.0588
	18	60	3.333333	23.52941
	18	0	0	0
6db	18	25	1.388889	5.310458
	18	25	1.388889	5.310458
	18	50	2.777778	21.24183
6ad	18	30	1.666667	5.882353
	18	30	1.666667	5.882353
	18	0	0	0
0.1% DMSO	18	0	0	0
	18	0	0	0
	18	90	5	26.47059
E3	18	0	0	0
	18	35	1.944444	6.29085
	18	15	0.833333	3.676471

ANOVA

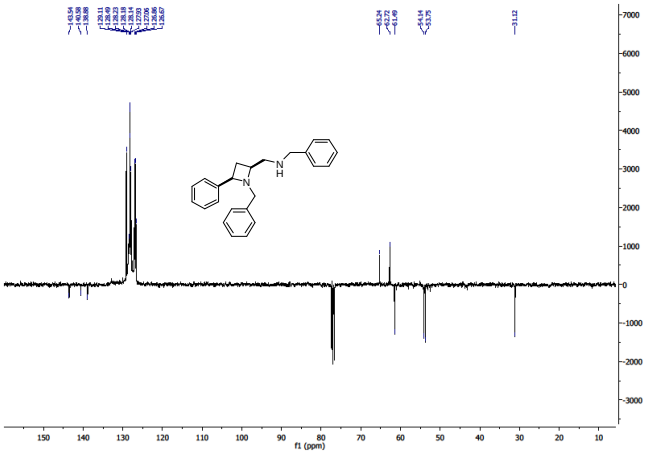
Source of Variation	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
Between Groups	397095.3	23	17265.01	79.56842	3.9E-135	1.555799
Within Groups	88529.17	408	216.9833			
Total	485624.5	431				

5 NMR Spectra

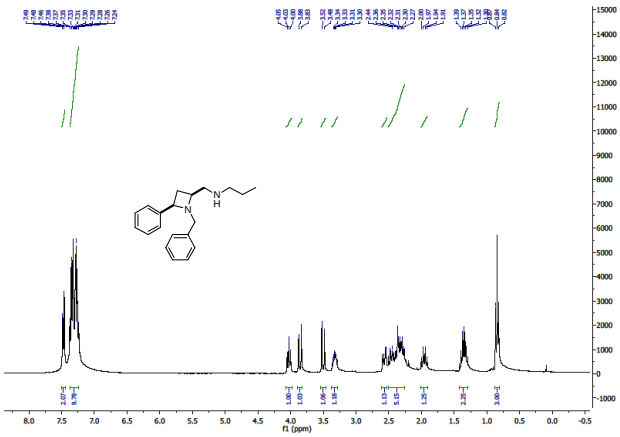
5.1.1.1 ^{1}H NMR Spectrum of *cis*-6aa



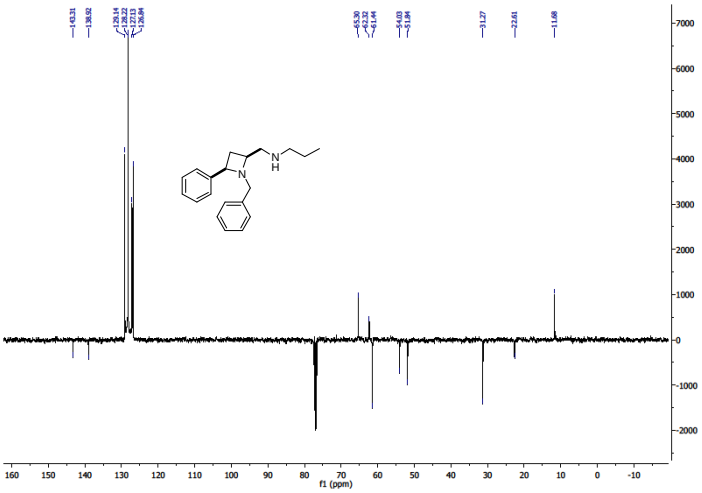
5.1.1.2 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *cis*-6aa



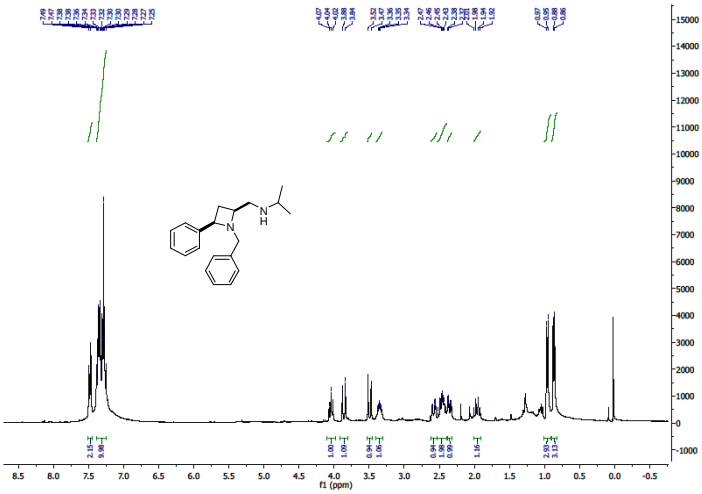
5.1.1.3 ^{1}H NMR Spectrum of *cis*-6ab



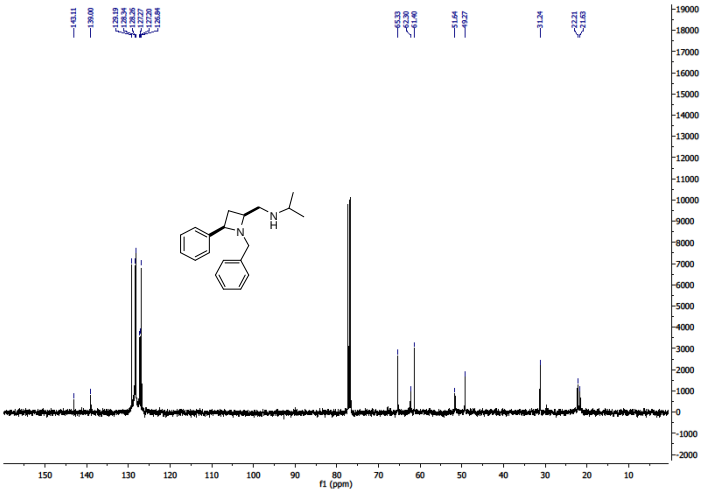
5.1.1.4 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ab



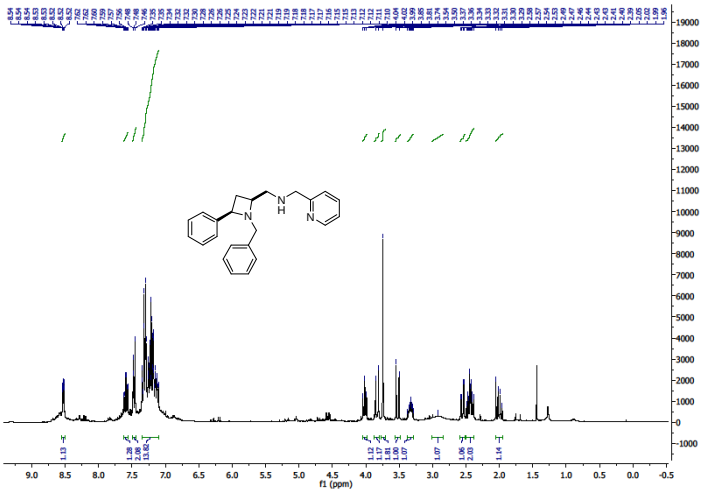
5.1.1.5 ^{1}H NMR Spectrum of *cis*-6ac



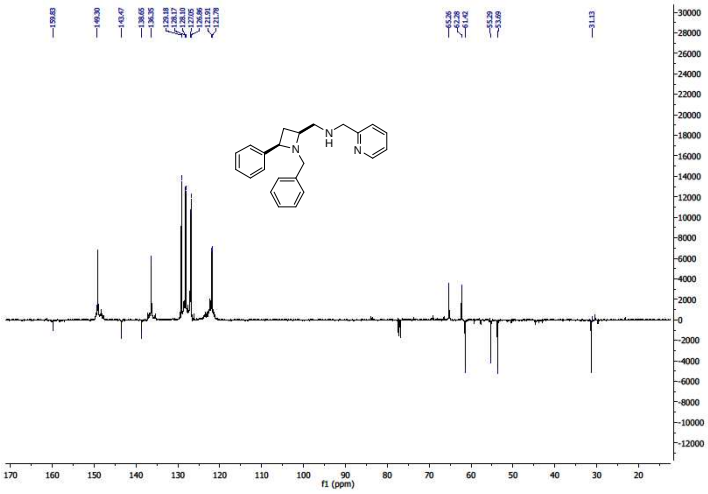
5.1.1.6 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6ac



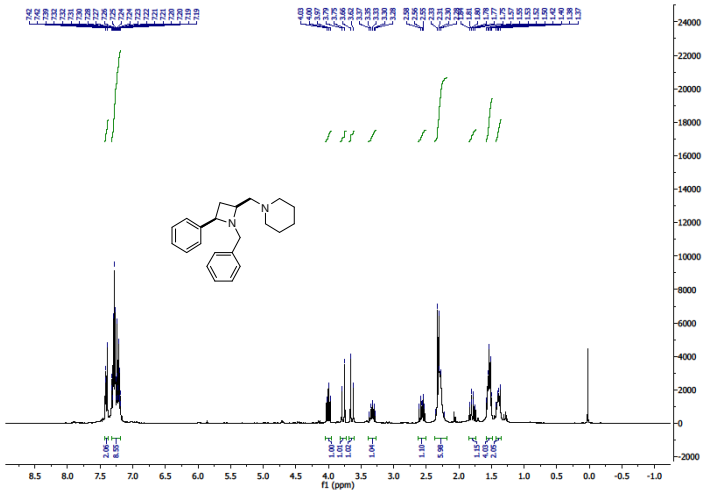
5.1.1.7 ^{1}H NMR Spectrum of *cis*-6ad



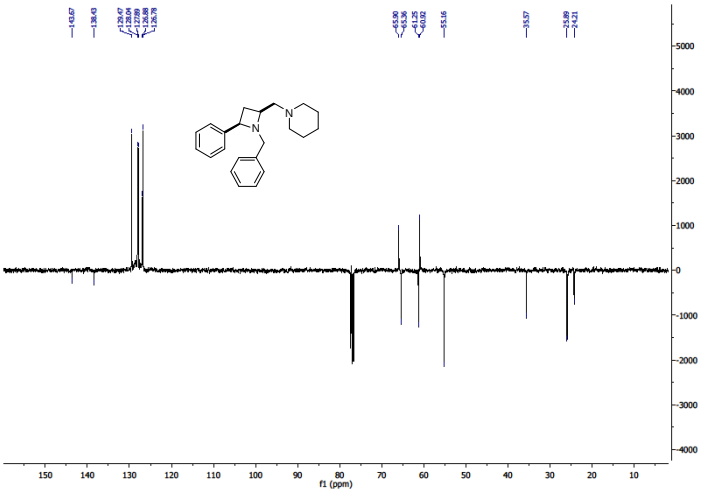
5.1.1.8 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ad



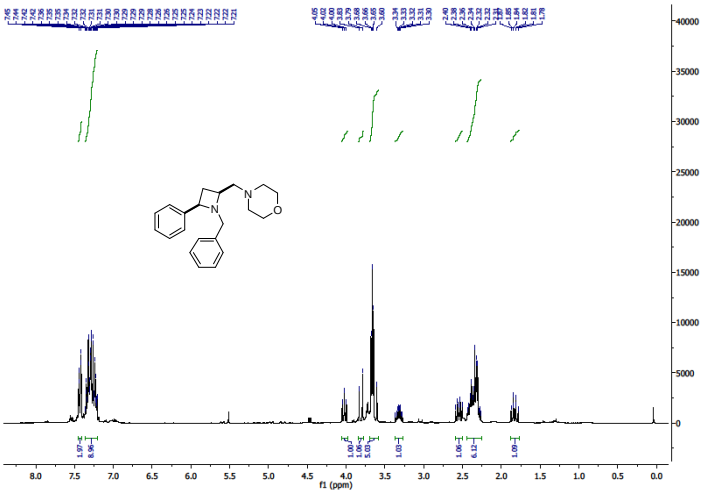
5.1.1.9 ^{1}H NMR Spectrum of *cis*-6ae



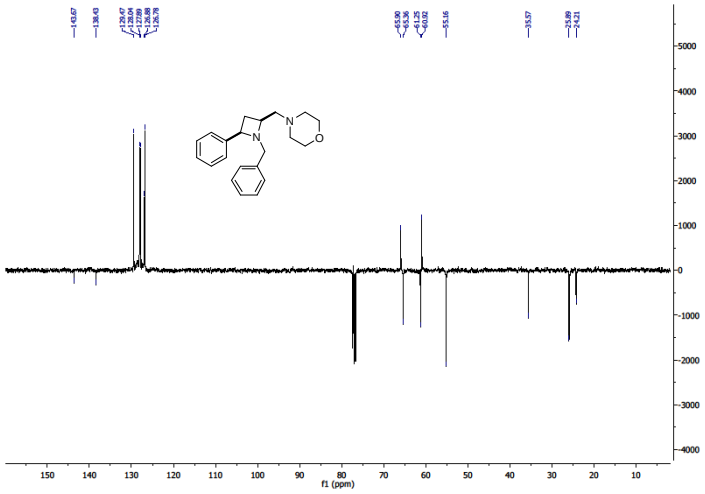
5.1.1.10 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ae



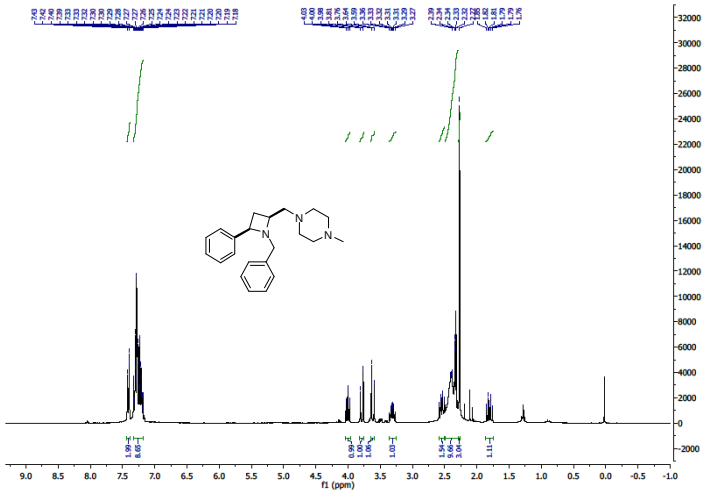
5.1.1.11 ^{1}H NMR Spectrum of *cis*-6af



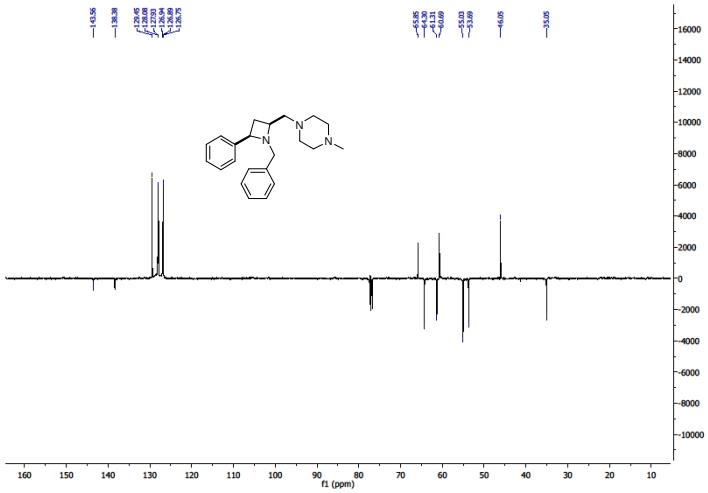
5.1.1.12 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6af



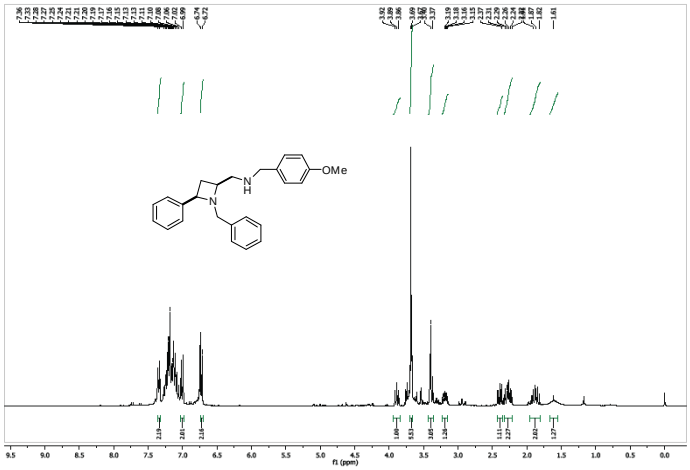
5.1.1.13 ^{1}H NMR Spectrum of *cis*-6ag



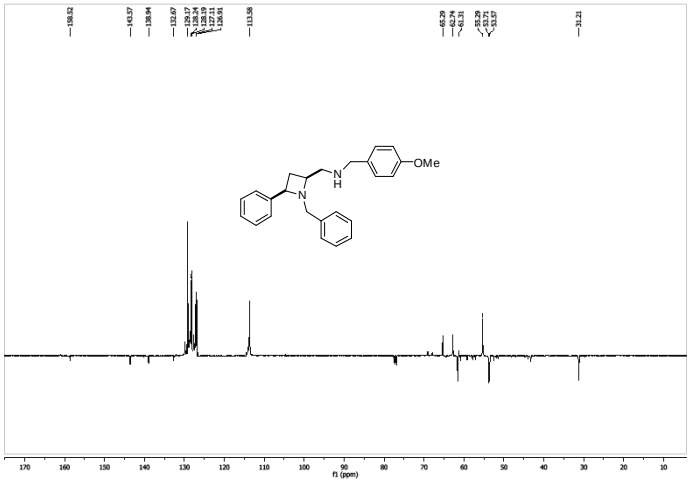
5.1.1.14 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ag



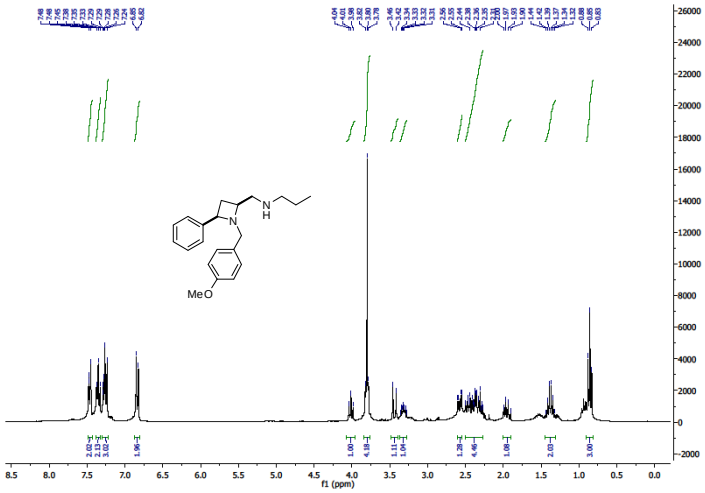
5.1.1.15 ^{1}H NMR Spectrum of *cis*-6ah



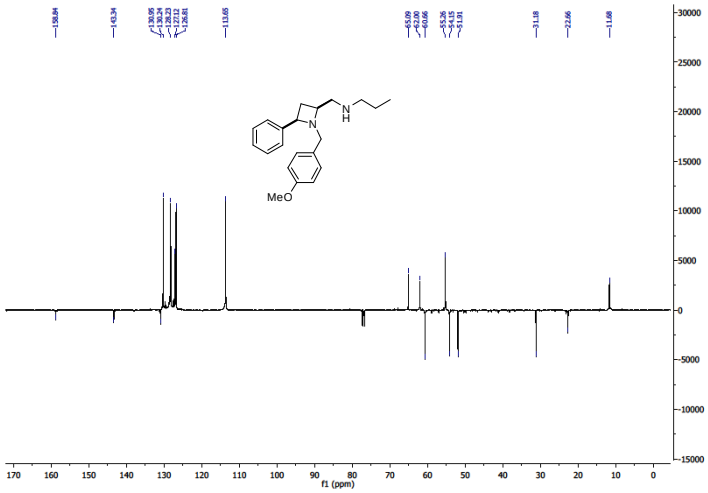
5.1.1.16 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ah



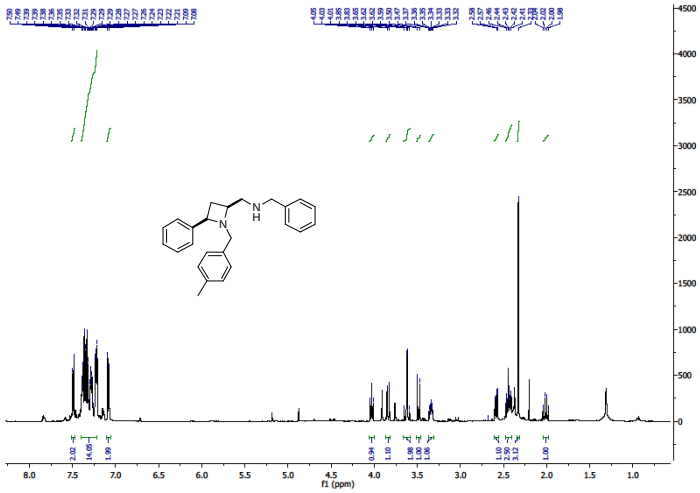
5.1.1.17 ^{1}H NMR Spectrum of *cis*-6bb



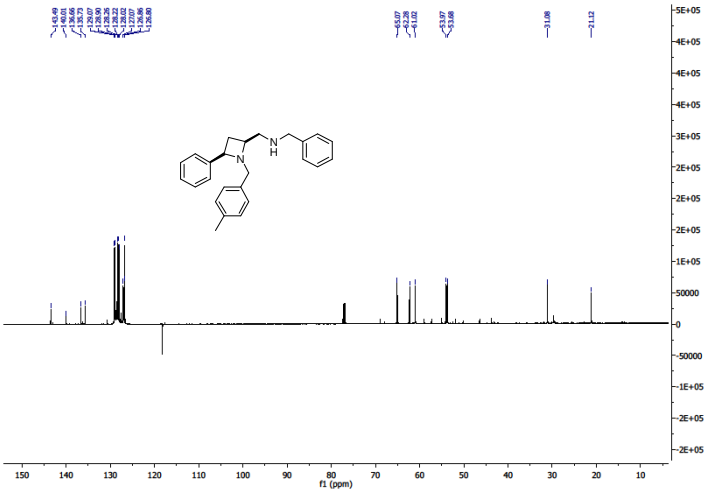
5.1.1.18 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6bb



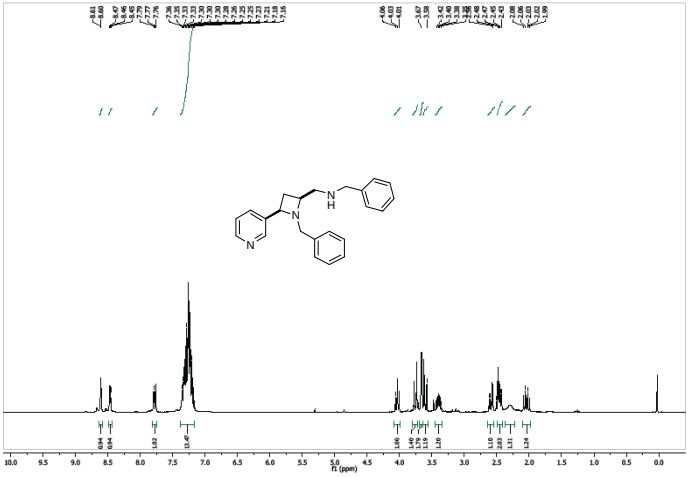
5.1.1.19 ^{1}H NMR Spectrum of *cis*-6ca



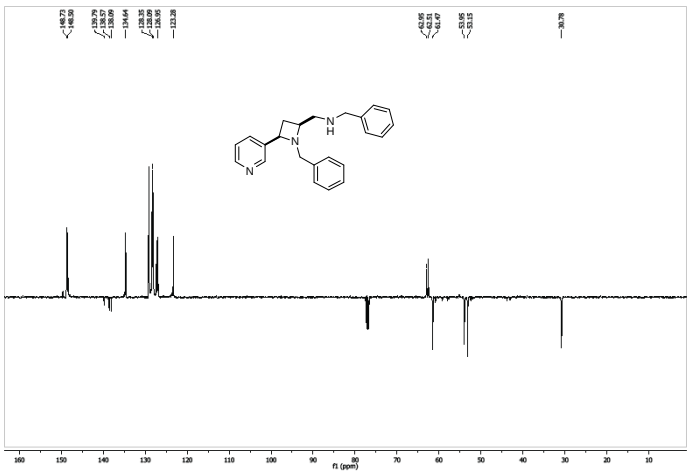
5.1.1.20 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6ca



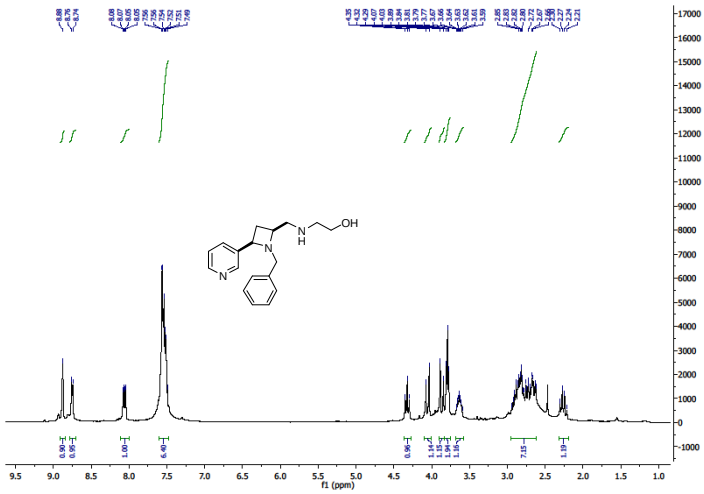
5.1.1.21 ^{1}H NMR Spectrum of *cis*-6da



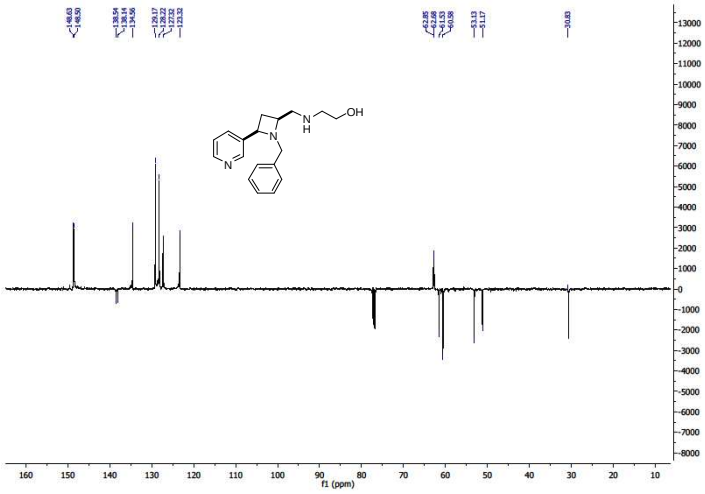
5.1.1.22 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6da



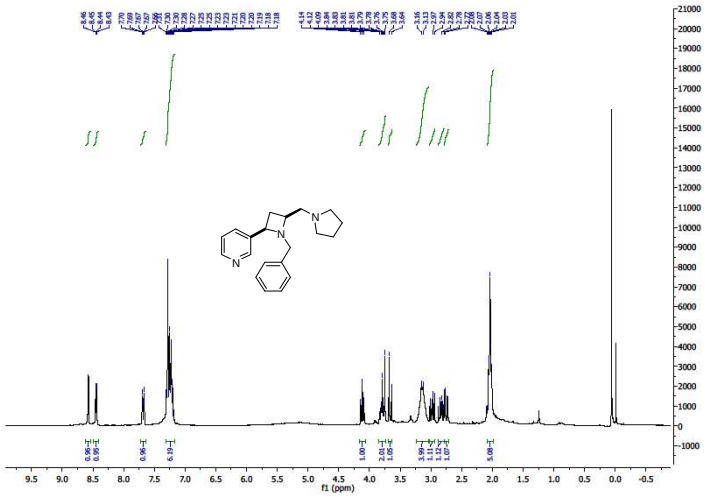
5.1.1.23 ^{1}H NMR Spectrum of *cis*-6di



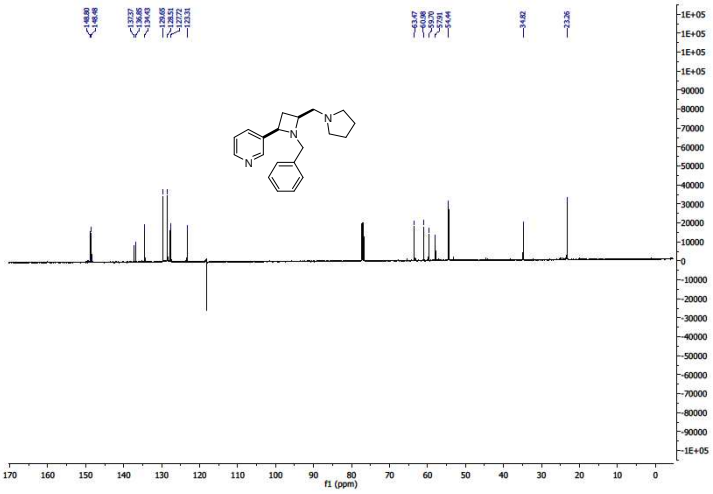
5.1.1.24 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6di



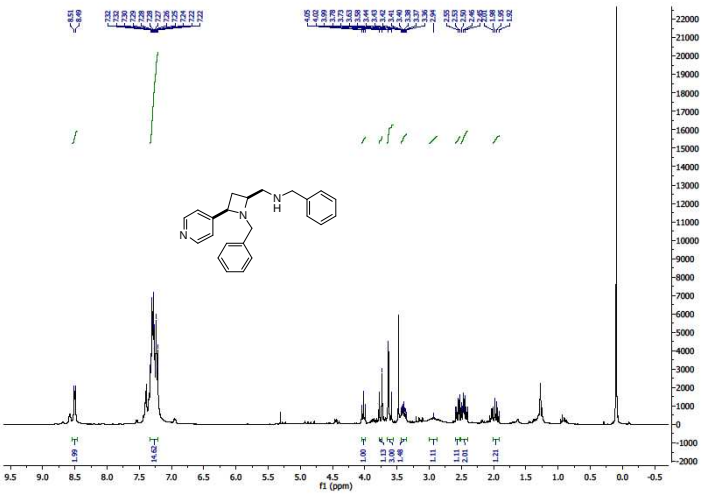
5.1.1.25 ^{1}H NMR Spectrum of *cis*-6dj



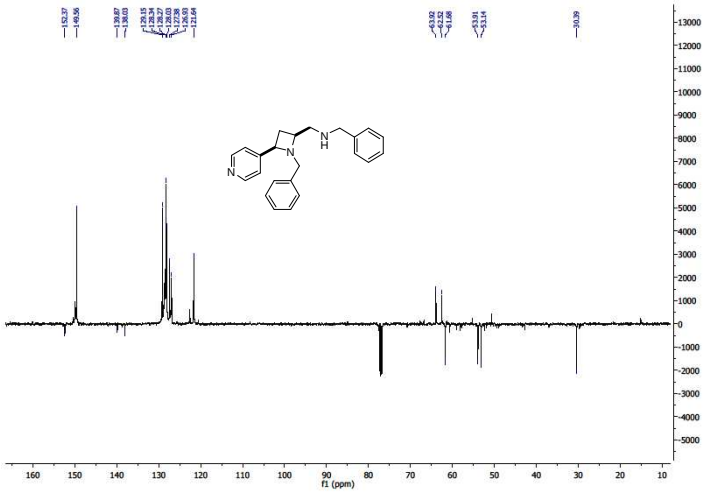
5.1.1.26 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6dj



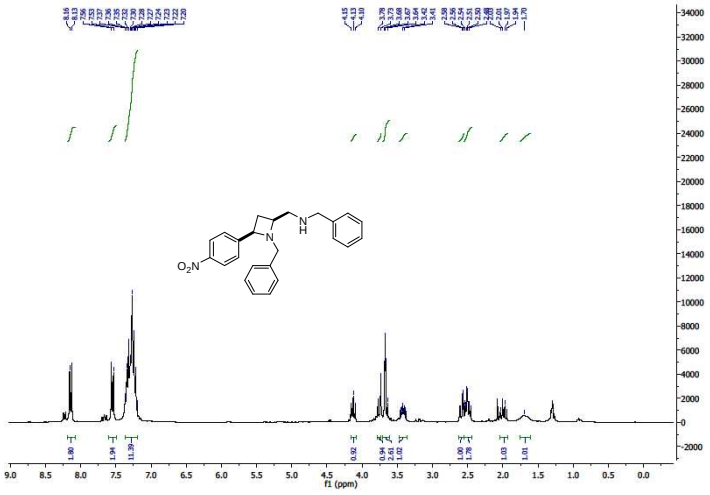
5.1.1.27 ^{1}H NMR Spectrum of *cis*-6ea



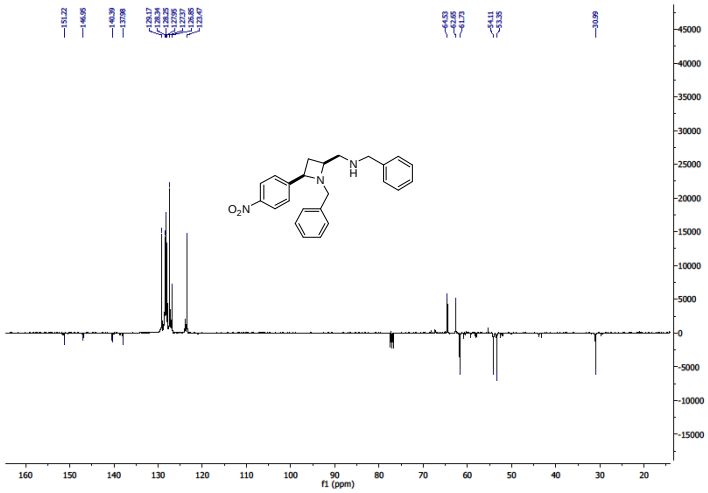
5.1.1.28 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ea



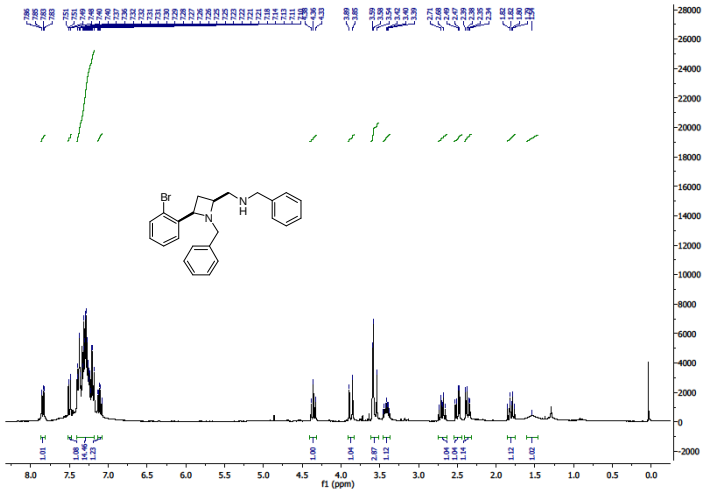
5.1.1.29 ^{1}H NMR Spectrum of *cis*-6fa



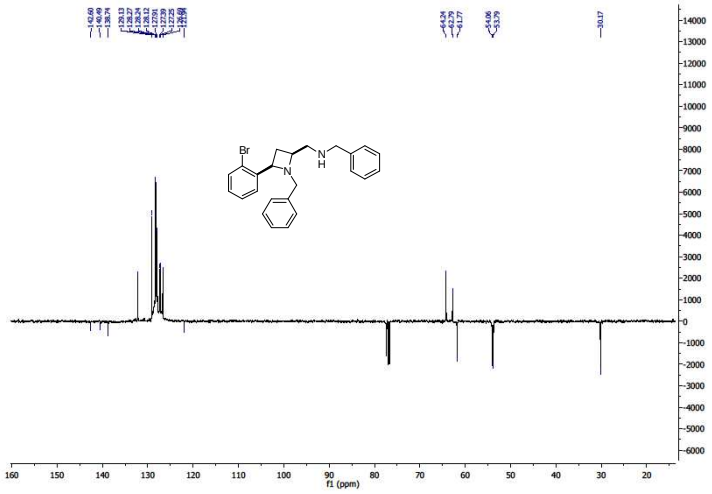
5.1.1.30 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6fa



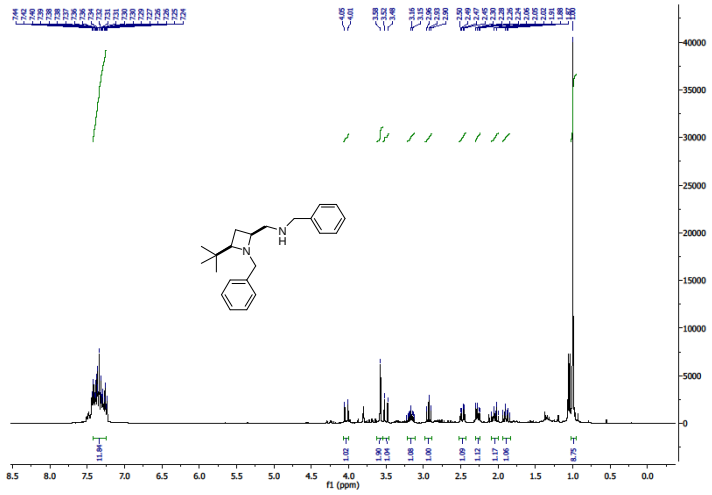
5.1.1.31 ^{1}H NMR Spectrum of *cis*-6ga



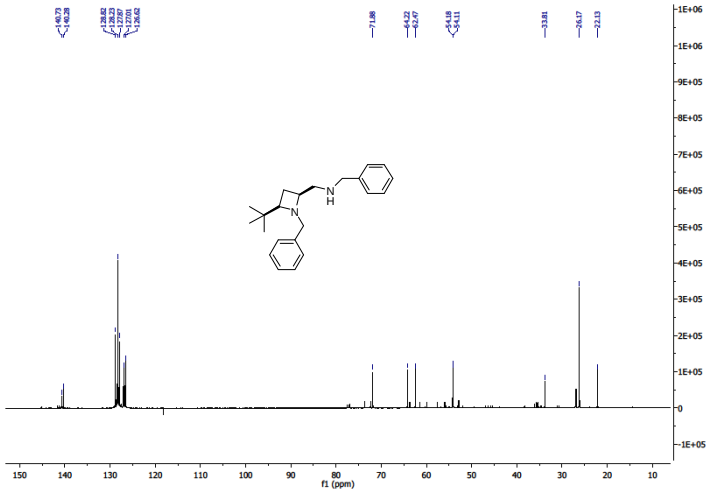
5.1.1.32 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6ga



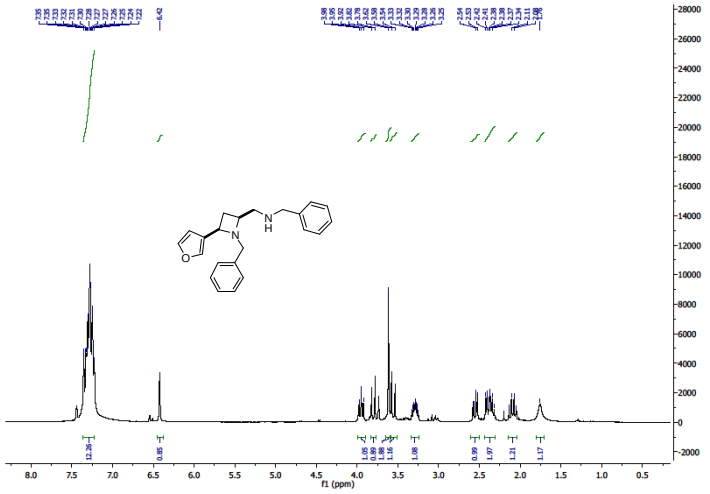
5.1.1.33 ^{1}H NMR Spectrum of *cis*-6ha



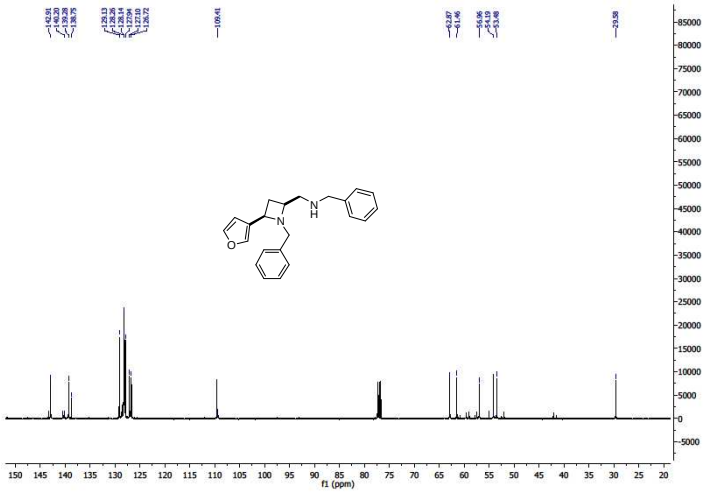
5.1.1.34 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6ha



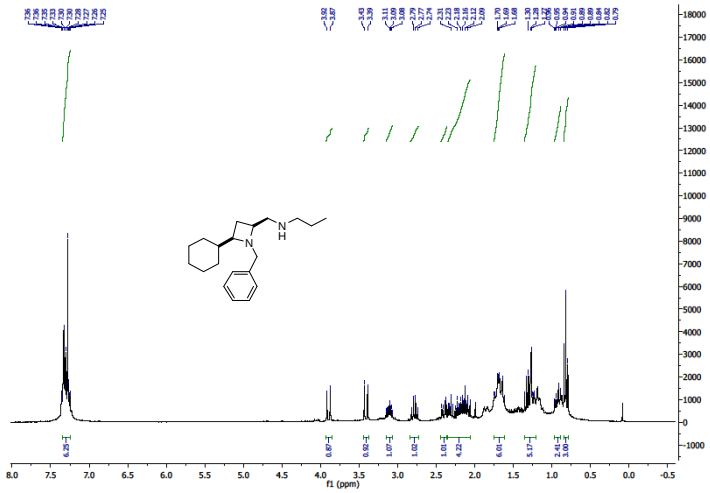
5.1.1.35 ^{1}H NMR Spectrum of *cis*-6ja



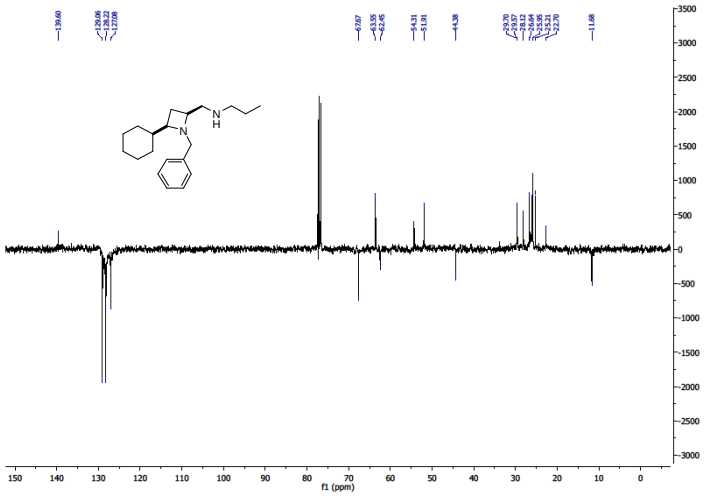
5.1.1.36 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6ja



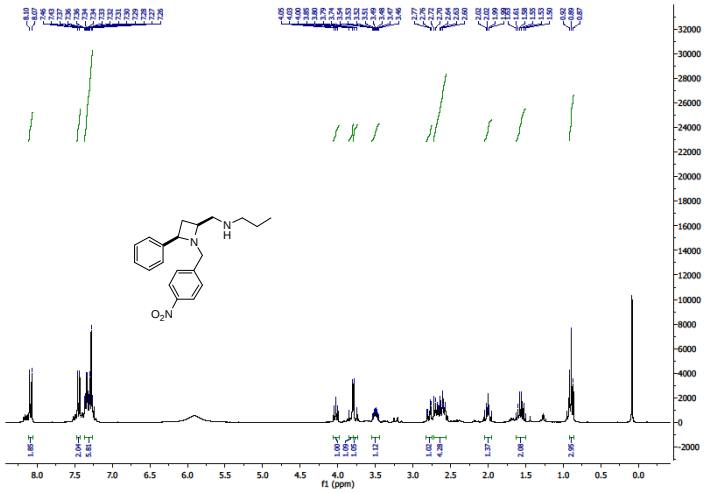
5.1.1.37 ^{1}H NMR Spectrum of *cis*-6kb



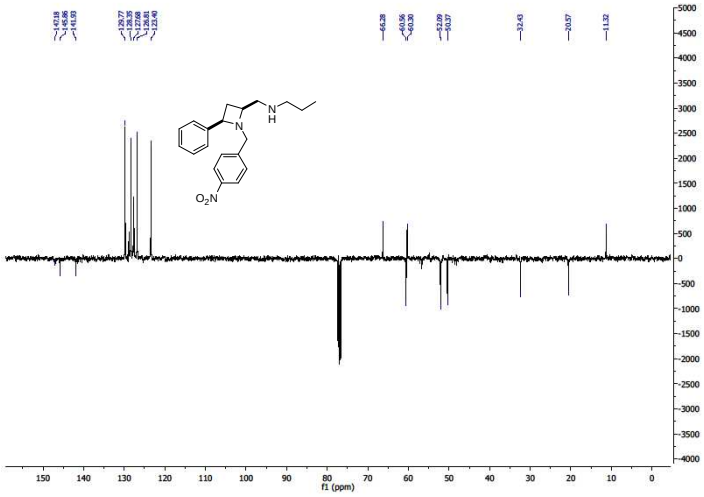
5.1.1.38 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6kb



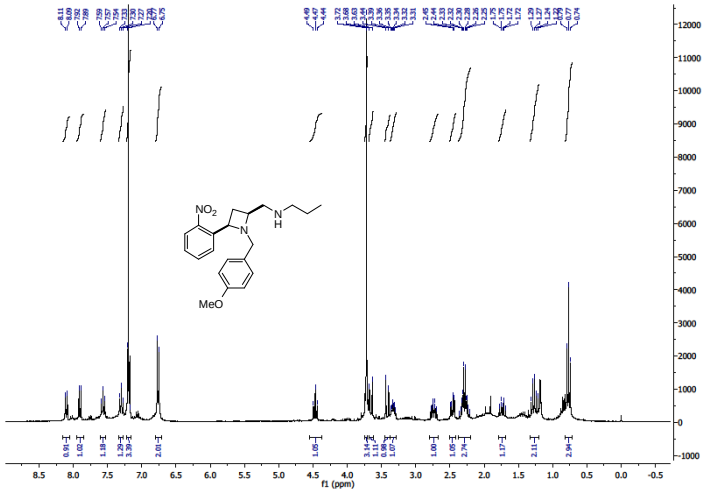
5.1.1.39 ^{1}H NMR Spectrum of *cis*-6lb



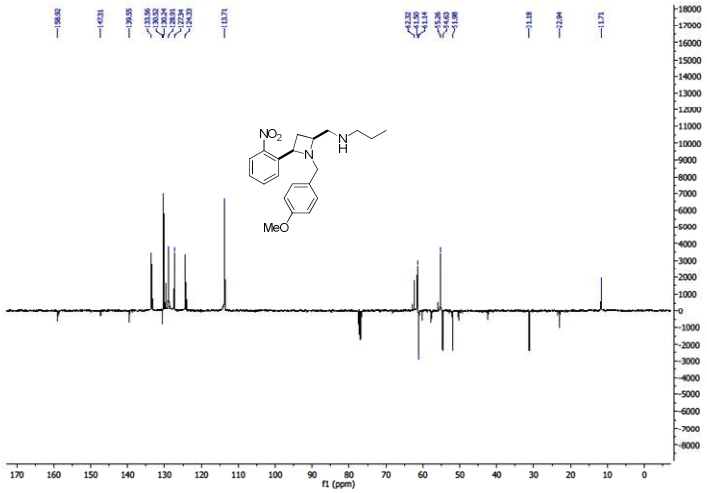
5.1.1.40 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6lb



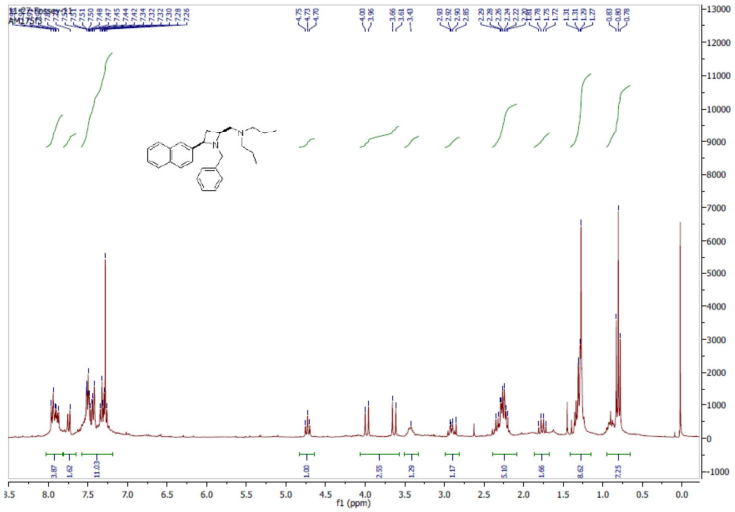
5.1.1.41 ^{1}H NMR Spectrum of *cis*-6mb



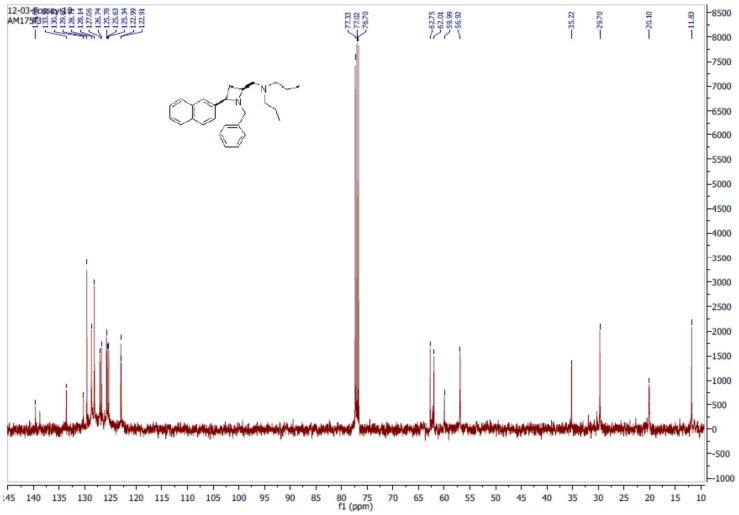
5.1.1.42 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-6mb



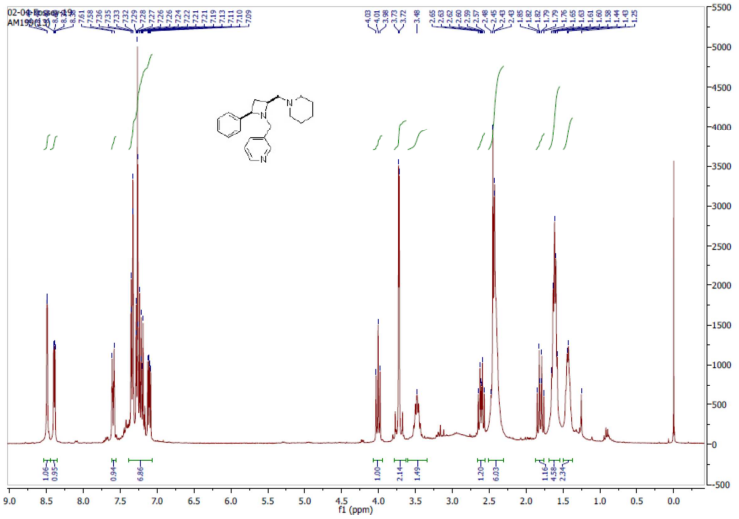
5.1.1.43 ^{1}H NMR Spectrum of *cis*-6ra



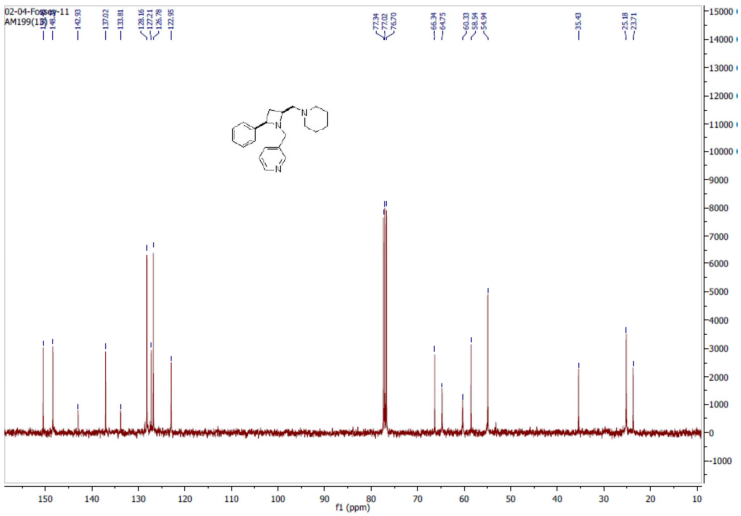
5.1.1.44 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6ra



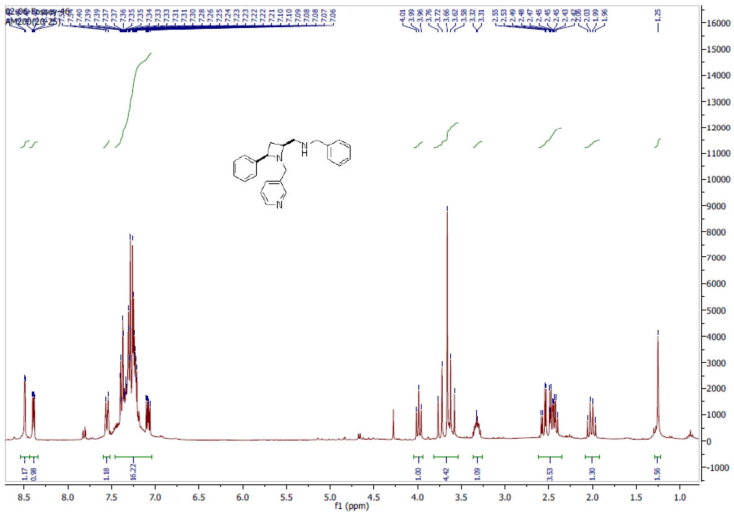
5.1.1.45 ^{1}H NMR Spectrum of *cis*-6sa



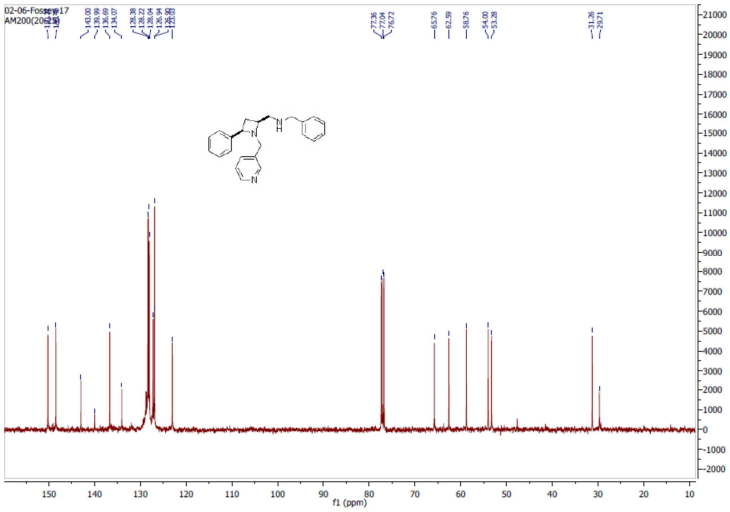
5.1.1.46 $^{13}C\{^{1}H\}$ NMR Spectrum of *cis*-6sa



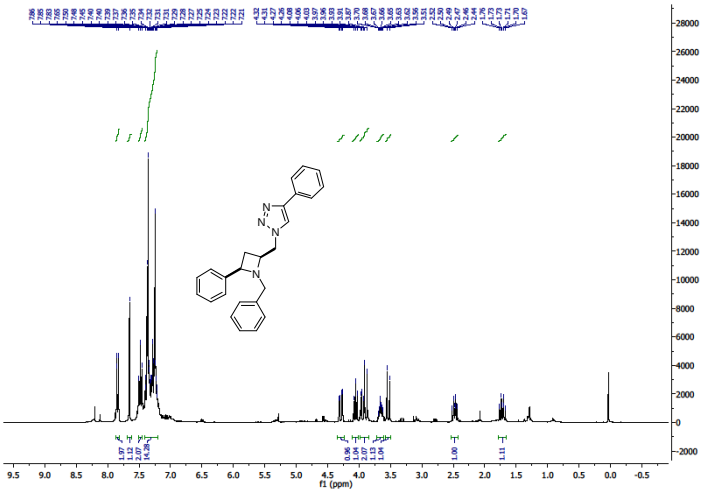
5.1.1.47 ^{1}H NMR Spectrum of *cis*-6sb



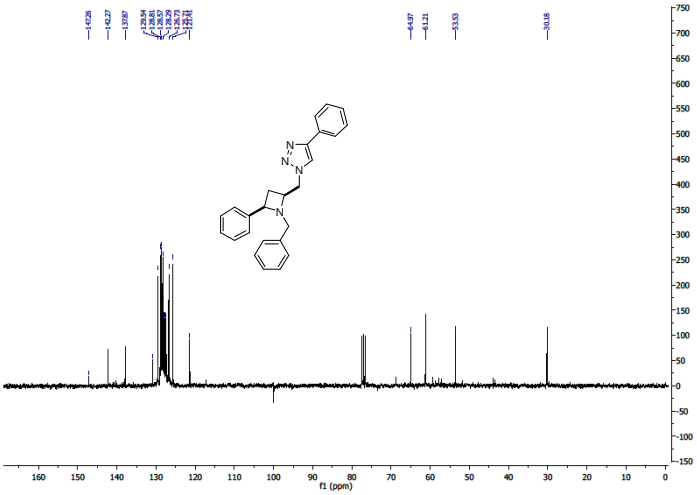
5.1.1.48 ^{13}C{^{1}H} NMR Spectrum of *cis*-6sb



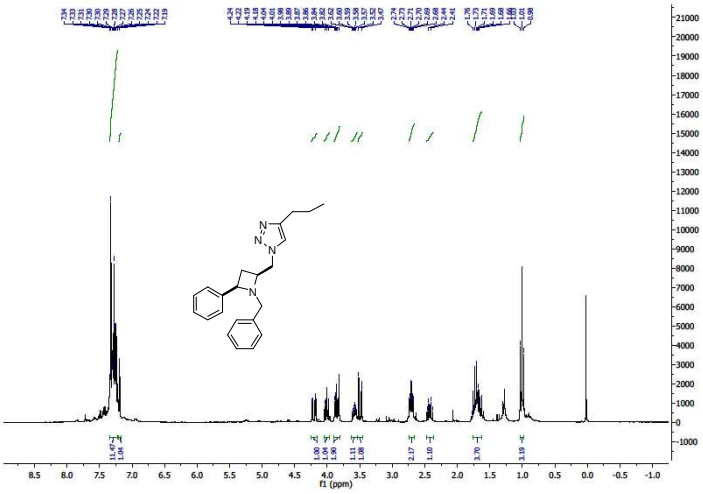
5.1.1.49 ^{1}H NMR Spectrum of *cis*-7aa



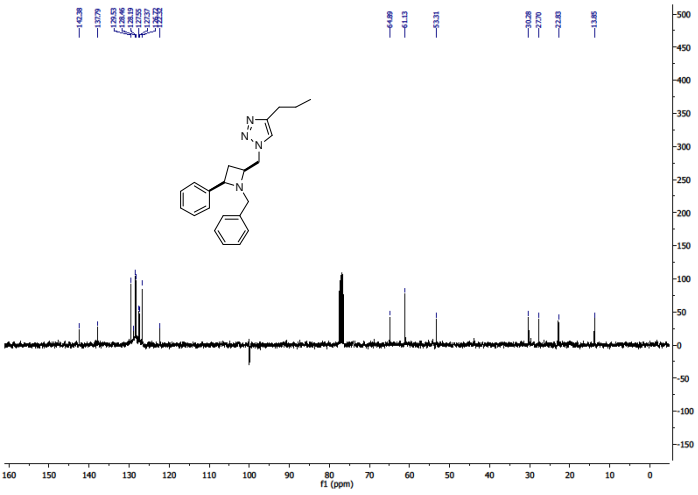
5.1.1.50 ^{13}C{^{1}H} NMR Spectrum of *cis*-7aa



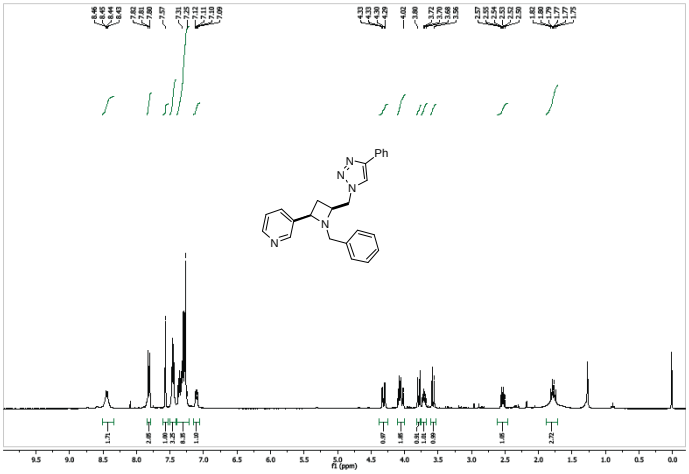
5.1.1.51 ^{1}H NMR Spectrum of *cis*-7ab



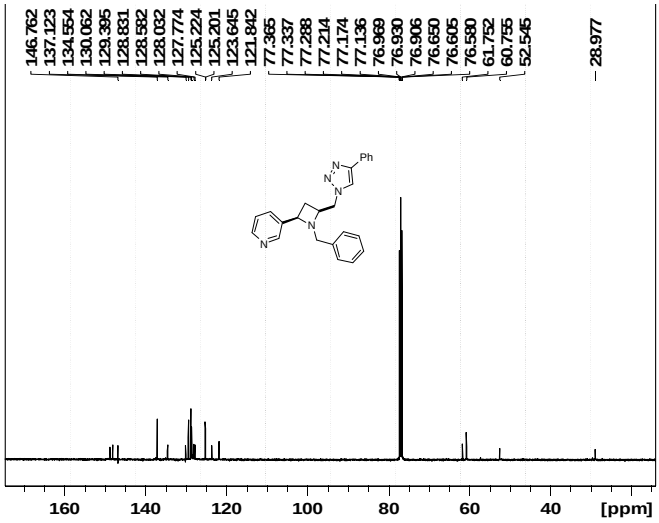
5.1.1.52 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *cis*-7ab



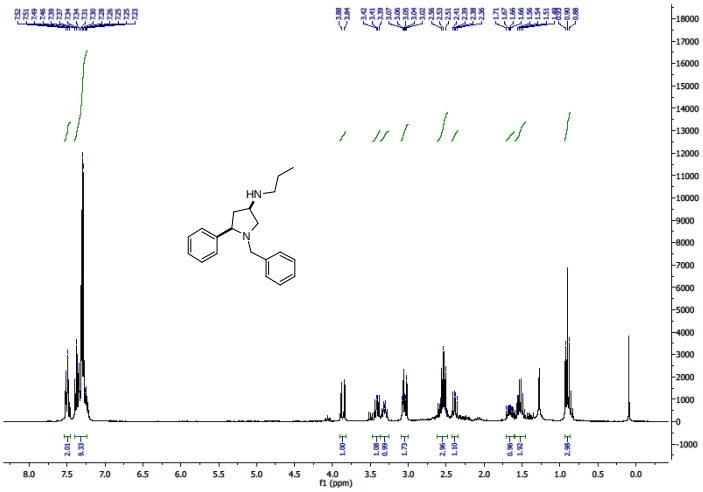
5.1.1.53 ^{1}H NMR Spectrum of *cis*-7da



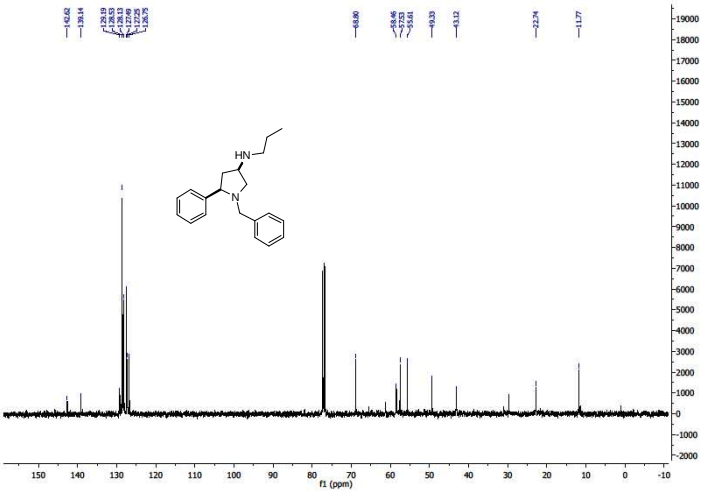
5.1.1.54 ^{13}C{^{1}H} NMR Spectrum of *cis*-7da



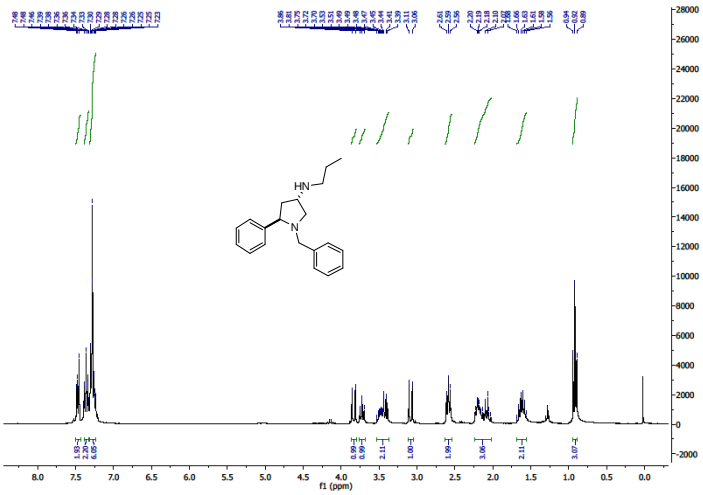
5.1.1.55 ^{1}H NMR Spectrum of *cis*-8ab



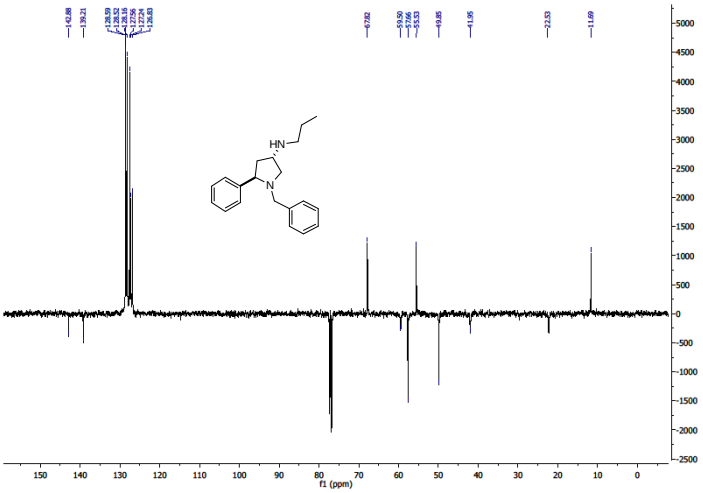
5.1.1.56 ^{13}C{^{1}H} NMR Spectrum of *cis*-8ab



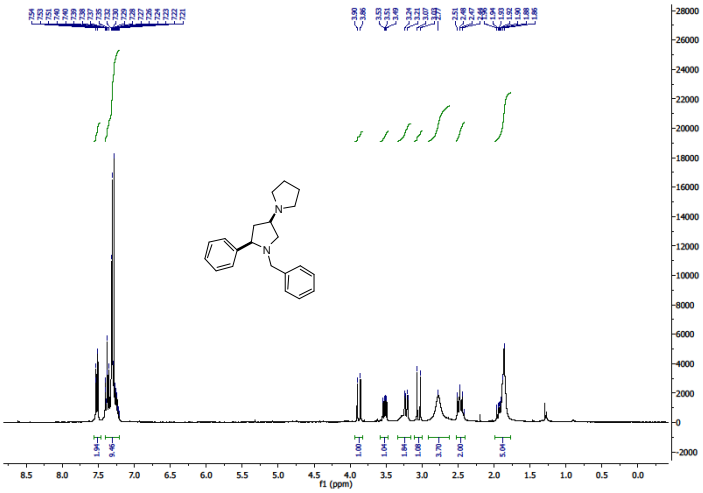
5.1.1.57 ^{1}H NMR Spectrum of *trans*-8ab



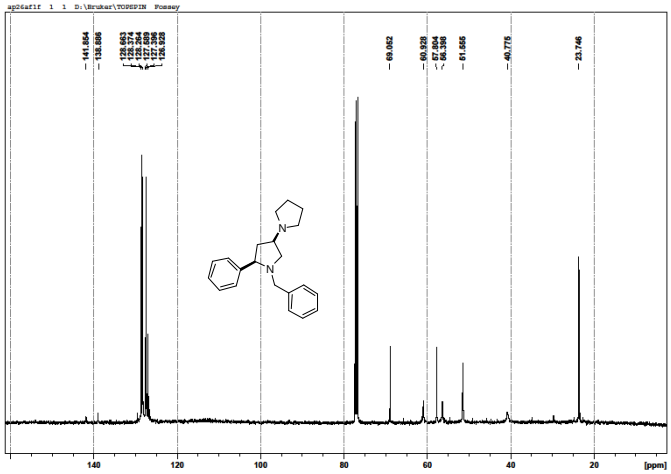
5.1.1.58 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *trans*-8ab



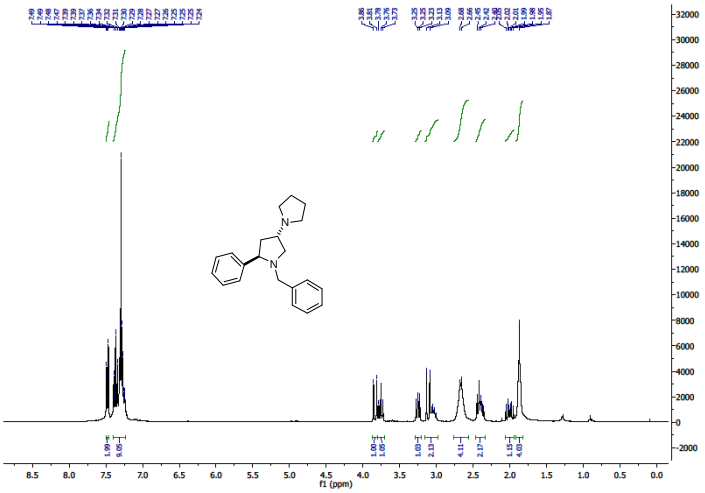
5.1.1.59 ^{1}H NMR Spectrum of *cis*-8aj



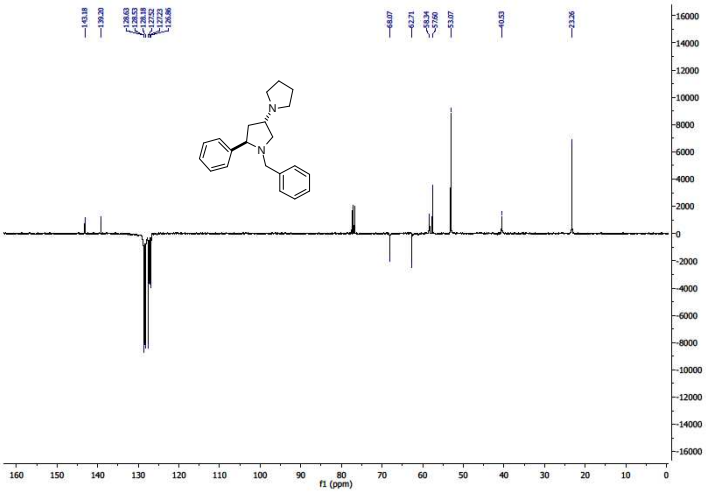
5.1.1.60 ^{13}C{^{1}H} NMR Spectrum of *cis*-8aj



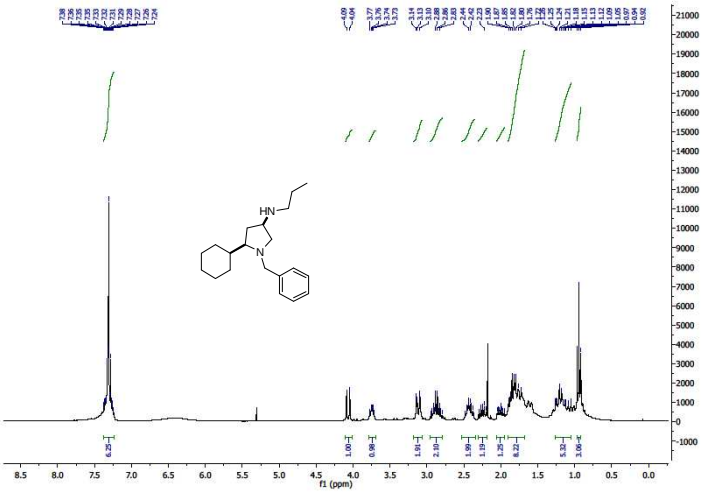
5.1.1.61 ^{1}H NMR Spectrum of *trans*-8aj



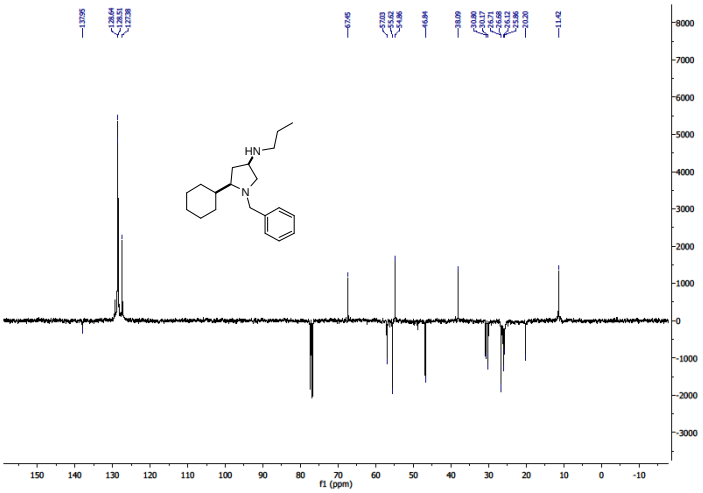
5.1.1.62 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *trans*-8aa



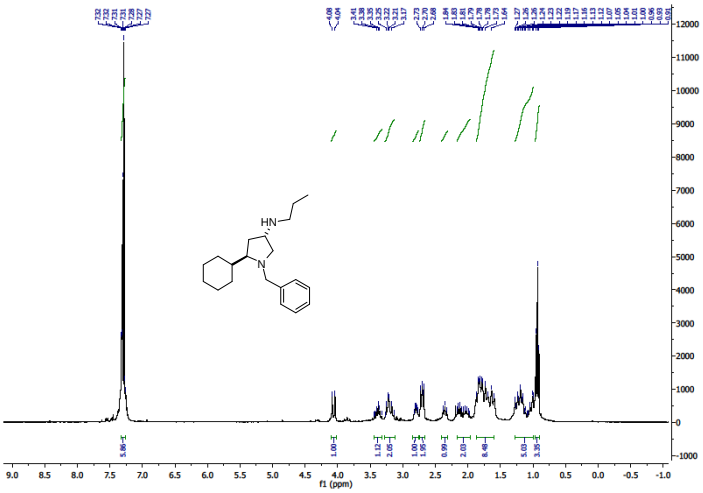
5.1.1.63 ^{1}H NMR Spectrum of *cis*-8kb



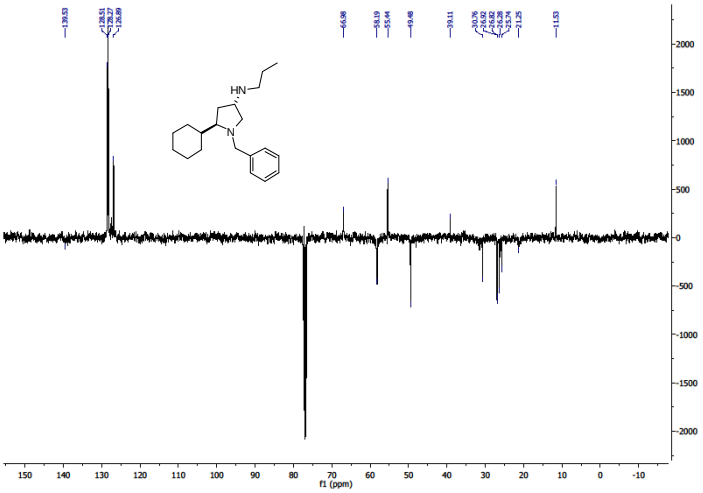
5.1.1.64 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *cis*-8kb



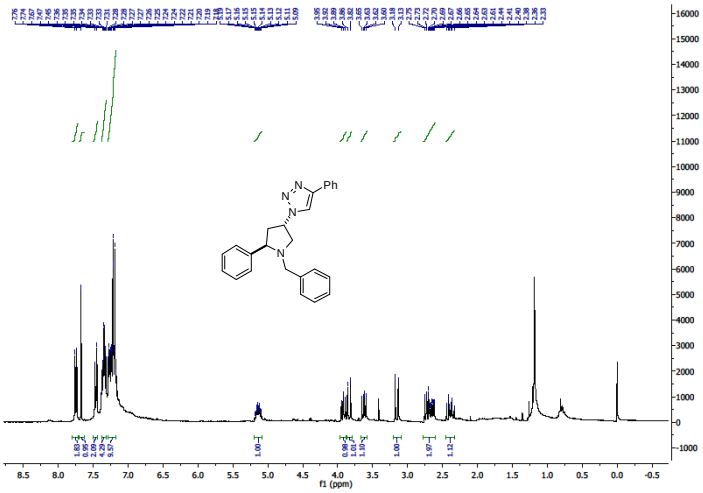
5.1.1.65 ^{1}H NMR Spectrum of *trans*-8kb



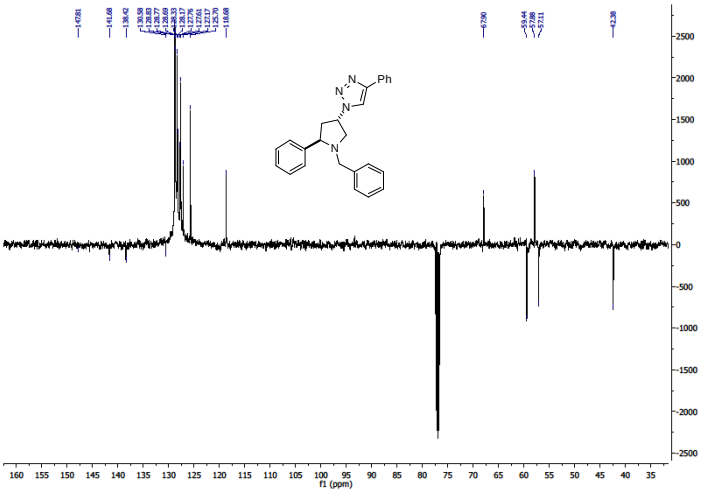
5.1.1.66 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *trans*-8kb



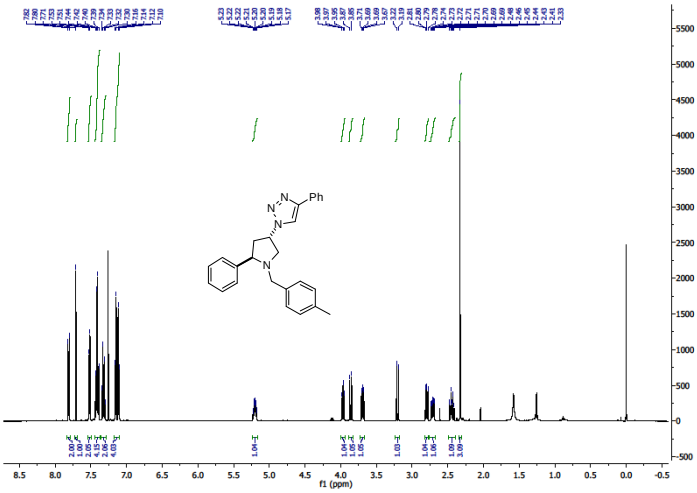
5.1.1.67 ^{1}H NMR Spectrum of *trans*-9aa



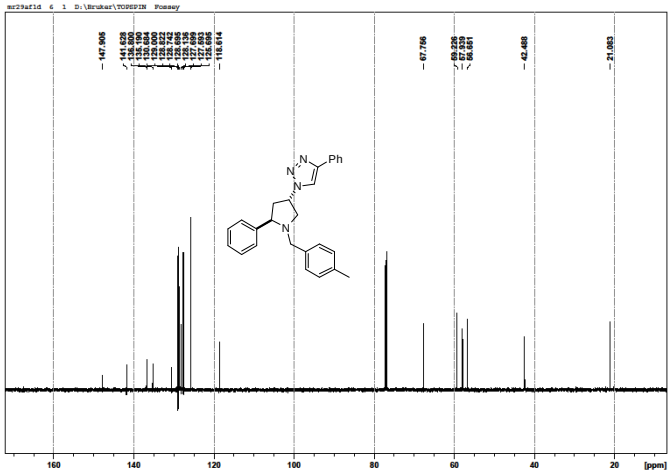
5.1.1.68 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *trans*-9aa



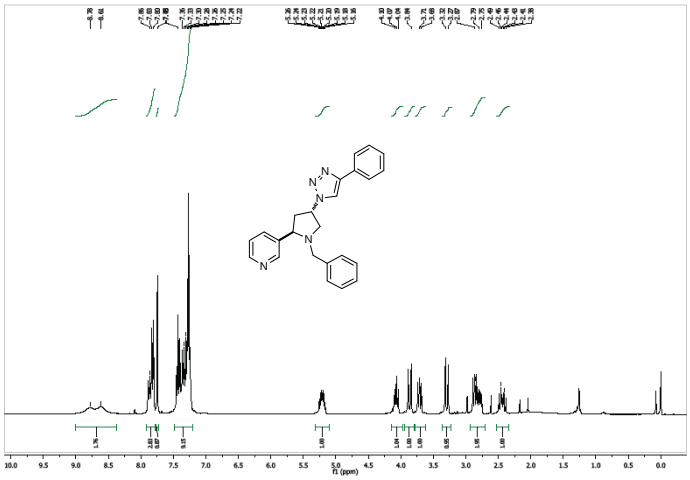
5.1.1.69 ^{1}H NMR Spectrum of *trans*-9ca



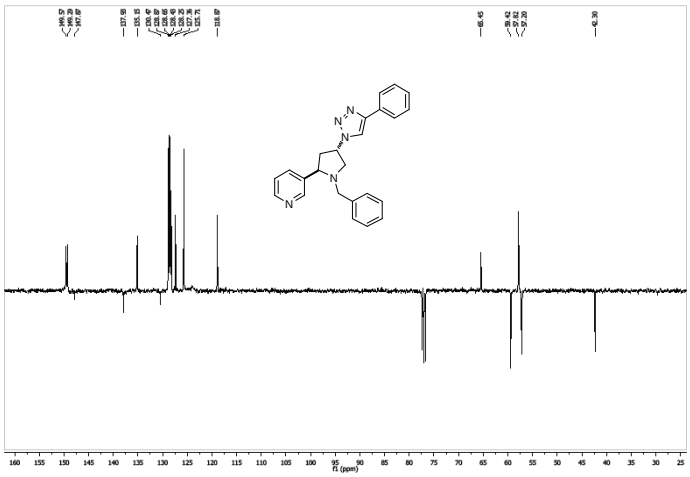
5.1.1.70 ^{13}C{^{1}H} NMR Spectrum of *trans*-9ca



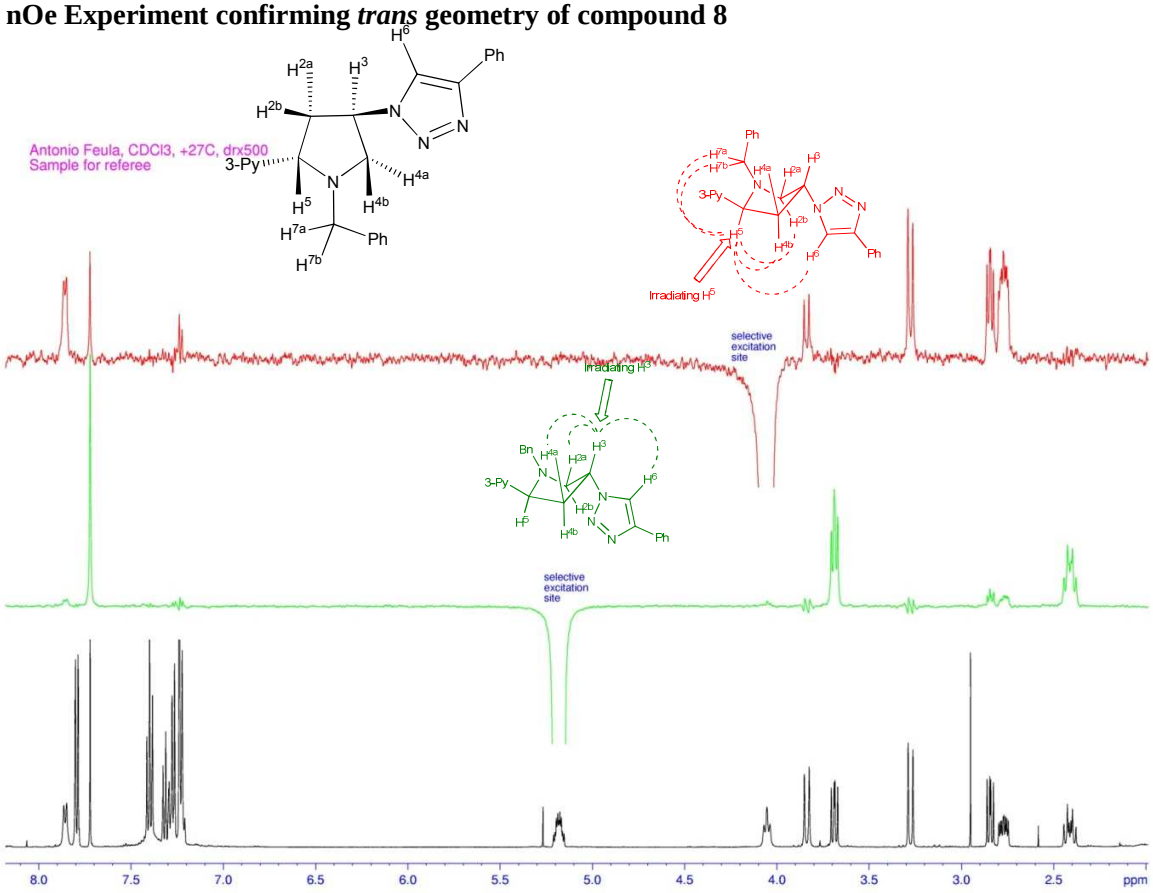
5.1.1.71 ^{1}H NMR Spectrum of *trans*-9da



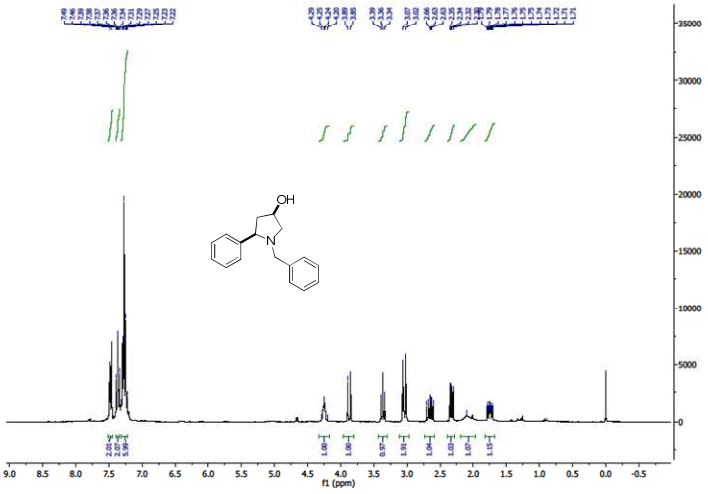
5.1.1.72 ^{13}C{^{1}H} NMR Spectrum (Pendant) of *trans*-9da



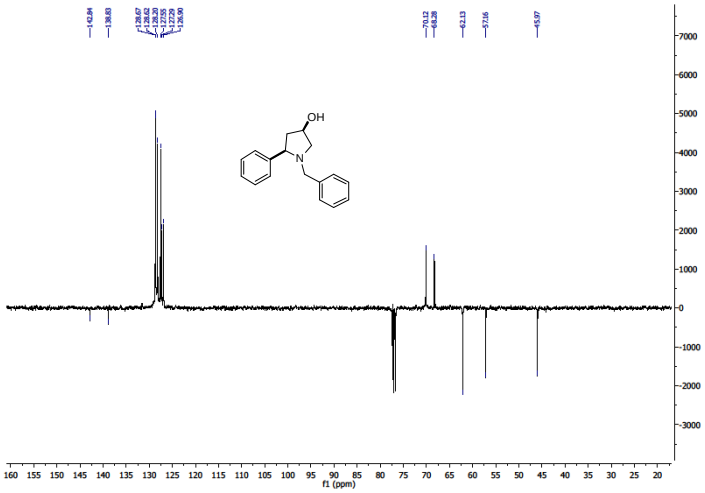
5.1.1.73 nOe Experiment confirming *trans* geometry of compound 8



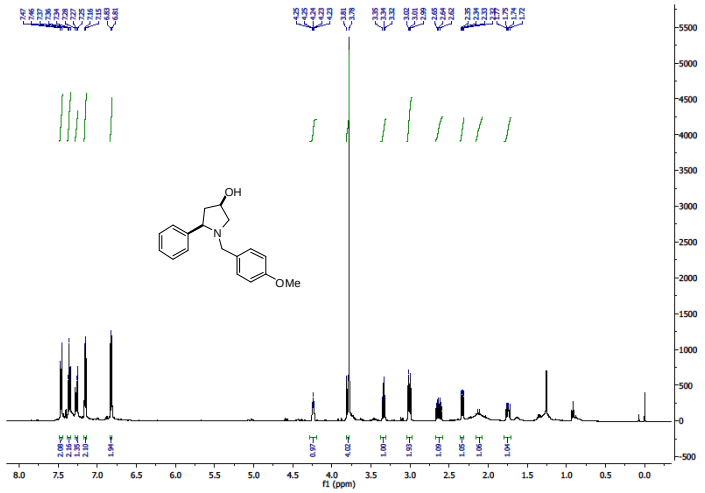
5.1.1.74 ^{1}H NMR Spectrum of *cis*-10a



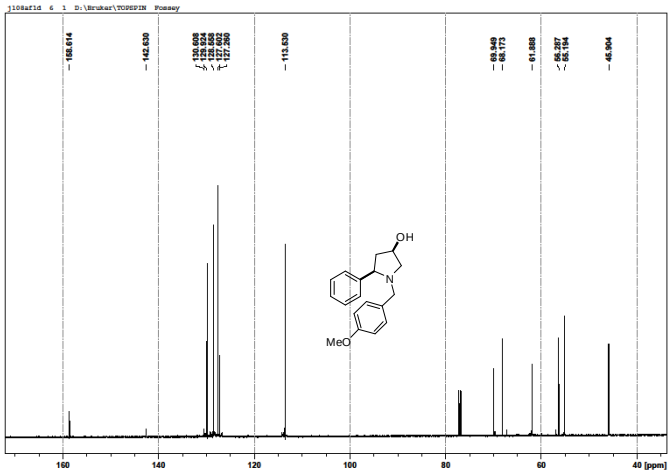
5.1.1.75 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-10a



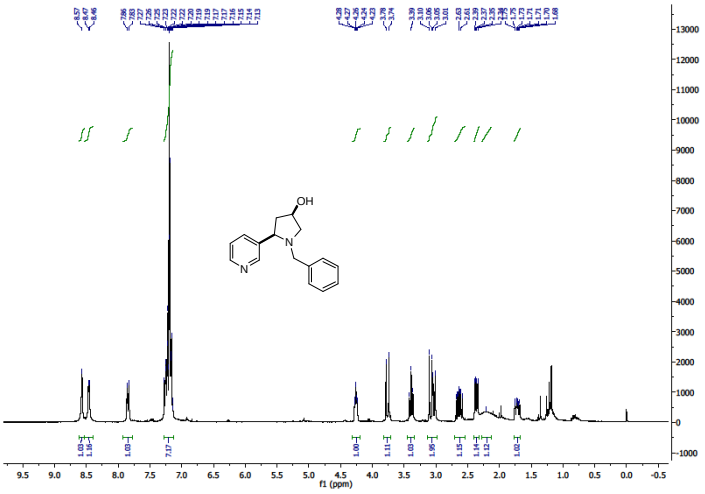
5.1.1.76 ^{1}H NMR Spectrum of *cis*-10b



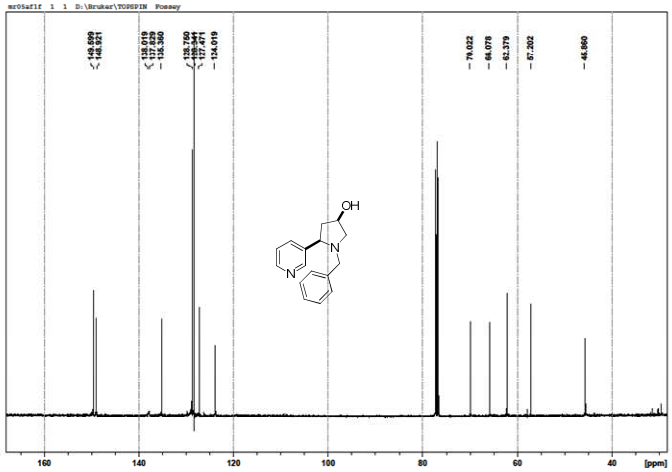
5.1.1.77 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-10b of 7aa



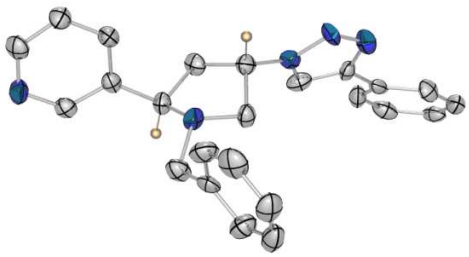
5.1.1.78 ^{1}H NMR Spectrum of *cis*-10d



5.1.1.79 $^{13}C\{^{1}H\}$ NMR Spectrum (Pendant) of *cis*-10d



6 X-Ray Crystallographic Information



6.1 Single Crystal Diffraction Data for trans-9da

$C_{24}H_{23}N_5$, 0.5($CHCl_3$), M = 441.16, Monoclinic, a = 5.8473(6), b = 36.267(4), c = 20.608(2) Å, β = 92.220(4)°, U = 4366.9(8) Å^3, T = 120(2) K, space group $P2_1/n$, Z = 8, 21376 reflections measured, 7487 unique (R_{int} = 0.1189) which were used in all calculations. The final $R1$ was 0.1380 ($I>2\sigma(I)$) and $wR(F_2)$ was 0.2569 (all data). CCDC 936733.

The structure contains two crystallographically-independent molecules, with all molecules in the unit cell displaying *trans* relative stereochemistry.

Suitable crystals of *trans*-**9da** were selected and a dataset was measured by the EPSRC UK National Crystallography Service[4] on a Bruker APEXII CCD diffractometer at the window of a Bruker FR591 rotating anode. The data collection was driven by COLLECT[5] and processed by DENZO[6] and an absorption correction was applied using SADABS[7] The structure was solved in SHELXS-97,[8] and was refined by a full-matrix least-squares procedure on F^2 in SHELXL-97.[8] All non-hydrogen atoms were refined with anisotropic displacement parameters. The hydrogen atoms were added at calculated positions and refined by use of a riding model with isotropic displacement parameters based on the equivalent isotropic displacement parameter (U_{eq}) of the parent atom.

Table 1. Crystal data and structure refinement for ***trans*-9da**.

Identification code	***trans*-9da**, 2010src0954	
Empirical formula	$C_{24}H_{23}N_5$, 0.5($CHCl_3$)	
Formula weight	441.16	
Temperature	120(2) K	
Wavelength	0.71073 Å	
Crystal system	Monoclinic	
Space group	P 2_1/n	
Unit cell dimensions	a = 5.8473(6) Å	α= 90°.
	b = 36.267(4) Å	β= 92.220(4)°.
	c = 20.608(2) Å	γ = 90°.
Volume	4366.9(8) Å^3	
Z	8	
Density (calculated)	1.342 Mg/m^3	
Absorption coefficient	0.259 mm^{-1}	
F(000)	1848	
Crystal size	0.17 x 0.04 x 0.01 mm^3	

Theta range for data collection	2.98 to 25.03°.
Index ranges	-6<=h<=6, -40<=k<=43, -24<=l<=24
Reflections collected	21376
Independent reflections	7487 [R(int) = 0.1189]
Completeness to theta = 25.03°	97.4 %
Absorption correction	Semi-empirical from equivalents
Max. and min. transmission	0.9974 and 0.9574
Refinement method	Full-matrix least-squares on F^2
Data / restraints / parameters	7487 / 0 / 559
Goodness-of-fit on F^2	1.185
Final R indices [I>2sigma(I)]	R1 = 0.1380, wR2 = 0.2068
R indices (all data)	R1 = 0.2538, wR2 = 0.2569
Largest diff. peak and hole	0.363 and -0.386 e.Å^{-3}

Notes:
There are two crystallographically-independent molecules in the structure, with half a molecule of chloroform per molecule.
The hydrogen atoms were fixed as riding models.

Table 2. Atomic coordinates (x 10^4) and equivalent isotropic displacement parameters (Å^{2}x 10^3) for ***trans*-9da**. U(eq) is defined as one third of the trace of the orthogonalized U^{ij} tensor.

	x	y	z	U(eq)
C(1)	5936(14)	1118(2)	5741(4)	30(2)
C(2)	7043(14)	730(2)	5668(4)	33(2)
C(3)	9251(14)	804(2)	5321(4)	32(2)
C(4)	8822(15)	1177(2)	4994(4)	34(2)
C(5)	6612(15)	1729(2)	5289(5)	41(2)
C(6)	8440(15)	2005(2)	5109(4)	35(2)
C(7)	10068(17)	2111(3)	5579(5)	47(3)
C(8)	11797(18)	2358(3)	5428(6)	54(3)
C(9)	11939(18)	2492(3)	4797(5)	49(3)
C(10)	10314(19)	2377(3)	4333(5)	52(3)
C(11)	8568(17)	2134(3)	4481(5)	47(3)
C(12)	8591(16)	349(2)	4386(4)	35(2)
C(13)	10135(14)	172(2)	4010(4)	28(2)
C(14)	9757(14)	-47(2)	3407(4)	31(2)
C(15)	7724(15)	-242(2)	3303(4)	37(2)
C(16)	7347(16)	-453(2)	2750(5)	41(2)
C(17)	9037(16)	-470(2)	2285(4)	36(2)
C(18)	11031(16)	-281(3)	2389(4)	38(2)
C(19)	11399(14)	-69(2)	2945(4)	35(2)
C(20)	5393(14)	1218(2)	6430(4)	30(2)
C(21)	7028(15)	1184(2)	6935(4)	35(2)
C(22)	6472(14)	1281(2)	7565(4)	36(2)
C(23)	4279(16)	1409(2)	7655(5)	39(2)
C(24)	3252(14)	1353(2)	6592(4)	32(2)
N(1)	7647(11)	1377(2)	5502(3)	31(2)
N(2)	9897(11)	522(2)	4841(3)	29(2)
N(3)	12160(11)	457(2)	4769(4)	35(2)
N(4)	12311(12)	247(2)	4259(4)	36(2)
N(5)	2651(12)	1449(2)	7191(4)	38(2)
C(101)	9192(15)	867(2)	1492(4)	33(2)
C(102)	8134(14)	658(2)	900(4)	37(2)
C(103)	5784(14)	522(2)	1138(4)	31(2)
C(104)	6092(14)	543(2)	1874(4)	33(2)
C(105)	8128(16)	968(3)	2628(4)	42(2)
C(106)	6285(14)	1156(2)	2997(4)	31(2)
C(107)	5990(16)	1538(3)	2950(4)	42(2)
C(108)	4184(17)	1709(3)	3246(4)	46(3)
C(109)	2666(16)	1506(3)	3593(4)	43(3)
C(110)	2939(15)	1129(3)	3657(5)	44(3)
C(111)	4704(16)	958(3)	3348(4)	38(2)

C(112)	6367(14)	-153(2)	828(4)	33(2)
C(113)	4809(13)	-431(2)	720(4)	30(2)
C(114)	5181(14)	-824(2)	609(4)	32(2)
C(115)	7237(15)	-952(3)	361(4)	39(2)
C(116)	7585(16)	-1326(3)	252(5)	43(2)
C(117)	5881(16)	-1576(3)	373(4)	43(2)
C(118)	3861(16)	-1457(3)	614(5)	45(3)
C(119)	3501(15)	-1083(3)	725(4)	38(2)
C(120)	10058(14)	1251(3)	1358(4)	35(2)
C(121)	12204(15)	1373(3)	1544(5)	43(3)
C(122)	12835(16)	1733(3)	1422(5)	44(3)
C(123)	11278(18)	1958(3)	1103(5)	51(3)
C(124)	8598(15)	1507(2)	1047(5)	40(2)
N(101)	7354(12)	888(2)	1958(3)	35(2)
N(102)	5107(11)	154(2)	920(3)	30(2)
N(103)	2854(11)	72(2)	865(3)	35(2)
N(104)	2638(12)	-281(2)	739(3)	38(2)
N(105)	9147(14)	1853(2)	910(4)	50(2)
C(201)	4925(15)	2829(3)	2558(5)	44(3)
Cl(21)	5574(5)	2861(1)	3403(1)	70(1)
Cl(22)	2034(4)	2723(1)	2420(2)	61(1)
Cl(23)	6659(4)	2494(1)	2206(1)	55(1)

Table 3. Bond lengths [Å] and angles [°] for ***trans*-9da**.

C(1)-N(1)	1.470(10)	C(17)-C(18)	1.363(12)
C(1)-C(20)	1.510(11)	C(17)-H(17)	0.9500
C(1)-C(2)	1.560(11)	C(18)-C(19)	1.392(12)
C(1)-H(1)	1.0000	C(18)-H(18)	0.9500
C(2)-C(3)	1.525(11)	C(19)-H(19)	0.9500
C(2)-H(2A)	0.9900	C(20)-C(21)	1.392(11)
C(2)-H(2B)	0.9900	C(20)-C(24)	1.397(11)
C(3)-N(2)	1.480(10)	C(21)-C(22)	1.396(11)
C(3)-C(4)	1.529(11)	C(21)-H(21)	0.9500
C(3)-H(3)	1.0000	C(22)-C(23)	1.383(12)
C(4)-N(1)	1.465(10)	C(22)-H(22)	0.9500
C(4)-H(4A)	0.9900	C(23)-N(5)	1.332(11)
C(4)-H(4B)	0.9900	C(23)-H(23)	0.9500
C(5)-N(1)	1.472(10)	C(24)-N(5)	1.343(10)
C(5)-C(6)	1.520(12)	C(24)-H(24)	0.9500
C(5)-H(5A)	0.9900	N(2)-N(3)	1.359(9)
C(5)-H(5B)	0.9900	N(3)-N(4)	1.303(9)
C(6)-C(11)	1.383(12)	C(101)-N(101)	1.471(10)
C(6)-C(7)	1.385(12)	C(101)-C(120)	1.508(12)
C(7)-C(8)	1.395(13)	C(101)-C(102)	1.546(11)
C(7)-H(7)	0.9500	C(101)-H(101)	1.0000
C(8)-C(9)	1.392(13)	C(102)-C(103)	1.558(11)
C(8)-H(8)	0.9500	C(102)-H(10A)	0.9900
C(9)-C(10)	1.387(14)	C(102)-H(10B)	0.9900
C(9)-H(9)	0.9500	C(103)-N(102)	1.457(10)
C(10)-C(11)	1.390(13)	C(103)-C(104)	1.523(11)
C(10)-H(10)	0.9500	C(103)-H(103)	1.0000
C(11)-H(11)	0.9500	C(104)-N(101)	1.459(10)
C(12)-N(2)	1.342(10)	C(104)-H(10C)	0.9900
C(12)-C(13)	1.371(11)	C(104)-H(10D)	0.9900
C(12)-H(12)	0.9500	C(105)-N(101)	1.466(10)
C(13)-N(4)	1.380(10)	C(105)-C(106)	1.506(11)
C(13)-C(14)	1.486(12)	C(105)-H(10E)	0.9900
C(14)-C(19)	1.379(11)	C(105)-H(10F)	0.9900
C(14)-C(15)	1.391(11)	C(106)-C(107)	1.397(12)
C(15)-C(16)	1.386(12)	C(106)-C(111)	1.396(11)
C(15)-H(15)	0.9500	C(107)-C(108)	1.387(12)
C(16)-C(17)	1.404(12)	C(107)-H(107)	0.9500
C(16)-H(16)	0.9500	C(108)-C(109)	1.375(13)

C(108)-H(108)	0.9500	N(1)-C(5)-H(5B)	109.4
C(109)-C(110)	1.384(13)	C(6)-C(5)-H(5B)	109.4
C(109)-H(109)	0.9500	H(5A)-C(5)-H(5B)	108.0
C(110)-C(111)	1.380(12)	C(11)-C(6)-C(7)	119.9(9)
C(110)-H(110)	0.9500	C(11)-C(6)-C(5)	121.1(9)
C(111)-H(111)	0.9500	C(7)-C(6)-C(5)	119.0(8)
C(112)-N(102)	1.351(10)	C(6)-C(7)-C(8)	120.6(9)
C(112)-C(113)	1.373(11)	C(6)-C(7)-H(7)	119.7
C(112)-H(112)	0.9500	C(8)-C(7)-H(7)	119.7
C(113)-N(104)	1.383(10)	C(9)-C(8)-C(7)	120.1(10)
C(113)-C(114)	1.460(12)	C(9)-C(8)-H(8)	119.9
C(114)-C(119)	1.387(12)	C(7)-C(8)-H(8)	119.9
C(114)-C(115)	1.403(11)	C(10)-C(9)-C(8)	118.3(10)
C(115)-C(116)	1.392(12)	C(10)-C(9)-H(9)	120.8
C(115)-H(115)	0.9500	C(8)-C(9)-H(9)	120.8
C(116)-C(117)	1.378(12)	C(9)-C(10)-C(11)	121.9(10)
C(116)-H(116)	0.9500	C(9)-C(10)-H(10)	119.0
C(117)-C(118)	1.370(13)	C(11)-C(10)-H(10)	119.0
C(117)-H(117)	0.9500	C(6)-C(11)-C(10)	119.1(10)
C(118)-C(119)	1.392(12)	C(6)-C(11)-H(11)	120.4
C(118)-H(118)	0.9500	C(10)-C(11)-H(11)	120.4
C(119)-H(119)	0.9500	N(2)-C(12)-C(13)	104.2(8)
C(120)-C(121)	1.372(12)	N(2)-C(12)-H(12)	127.9
C(120)-C(124)	1.402(12)	C(13)-C(12)-H(12)	127.9
C(121)-C(122)	1.382(12)	C(12)-C(13)-N(4)	108.4(8)
C(121)-H(121)	0.9500	C(12)-C(13)-C(14)	130.1(8)
C(122)-C(123)	1.371(13)	N(4)-C(13)-C(14)	121.4(7)
C(122)-H(122)	0.9500	C(19)-C(14)-C(15)	118.7(8)
C(123)-N(105)	1.348(12)	C(19)-C(14)-C(13)	121.5(8)
C(123)-H(123)	0.9500	C(15)-C(14)-C(13)	119.8(8)
C(124)-N(105)	1.328(11)	C(16)-C(15)-C(14)	120.9(8)
C(124)-H(124)	0.9500	C(16)-C(15)-H(15)	119.5
N(102)-N(103)	1.351(9)	C(14)-C(15)-H(15)	119.5
N(103)-N(104)	1.315(9)	C(15)-C(16)-C(17)	119.5(9)
C(201)-Cl(22)	1.746(9)	C(15)-C(16)-H(16)	120.3
C(201)-Cl(23)	1.758(10)	C(17)-C(16)-H(16)	120.3
C(201)-Cl(21)	1.772(10)	C(18)-C(17)-C(16)	119.5(8)
C(201)-H(201)	1.0000	C(18)-C(17)-H(17)	120.3
N(1)-C(1)-C(20)	109.5(7)	C(16)-C(17)-H(17)	120.3
N(1)-C(1)-C(2)	104.7(6)	C(17)-C(18)-C(19)	120.8(9)
C(20)-C(1)-C(2)	114.2(7)	C(17)-C(18)-H(18)	119.6
N(1)-C(1)-H(1)	109.4	C(19)-C(18)-H(18)	119.6
C(20)-C(1)-H(1)	109.4	C(14)-C(19)-C(18)	120.7(8)
C(2)-C(1)-H(1)	109.4	C(14)-C(19)-H(19)	119.7
C(3)-C(2)-C(1)	104.3(7)	C(18)-C(19)-H(19)	119.7
C(3)-C(2)-H(2A)	110.9	C(21)-C(20)-C(24)	116.6(8)
C(1)-C(2)-H(2A)	110.9	C(21)-C(20)-C(1)	121.2(7)
C(3)-C(2)-H(2B)	110.9	C(24)-C(20)-C(1)	122.2(8)
C(1)-C(2)-H(2B)	110.9	C(20)-C(21)-C(22)	119.7(8)
H(2A)-C(2)-H(2B)	108.9	C(20)-C(21)-H(21)	120.1
N(2)-C(3)-C(2)	115.7(7)	C(22)-C(21)-H(21)	120.1
N(2)-C(3)-C(4)	111.0(7)	C(23)-C(22)-C(21)	117.5(9)
C(2)-C(3)-C(4)	103.7(7)	C(23)-C(22)-H(22)	121.3
N(2)-C(3)-H(3)	108.7	C(21)-C(22)-H(22)	121.3
C(2)-C(3)-H(3)	108.7	N(5)-C(23)-C(22)	125.5(9)
C(4)-C(3)-H(3)	108.7	N(5)-C(23)-H(23)	117.3
N(1)-C(4)-C(3)	101.3(6)	C(22)-C(23)-H(23)	117.3
N(1)-C(4)-H(4A)	111.5	N(5)-C(24)-C(20)	125.5(8)
C(3)-C(4)-H(4A)	111.5	N(5)-C(24)-H(24)	117.3
N(1)-C(4)-H(4B)	111.5	C(20)-C(24)-H(24)	117.3
C(3)-C(4)-H(4B)	111.5	C(4)-N(1)-C(1)	105.6(6)
H(4A)-C(4)-H(4B)	109.3	C(4)-N(1)-C(5)	114.4(7)
N(1)-C(5)-C(6)	111.0(7)	C(1)-N(1)-C(5)	112.1(6)
N(1)-C(5)-H(5A)	109.4	C(12)-N(2)-N(3)	111.8(7)
C(6)-C(5)-H(5A)	109.4	C(12)-N(2)-C(3)	129.5(7)

N(3)-N(2)-C(3)	117.9(7)
N(4)-N(3)-N(2)	106.7(7)
N(3)-N(4)-C(13)	108.9(7)
C(23)-N(5)-C(24)	115.3(8)
N(101)-C(101)-C(120)	109.5(7)
N(101)-C(101)-C(102)	105.1(7)
C(120)-C(101)-C(102)	115.8(7)
N(101)-C(101)-H(101)	108.8
C(120)-C(101)-H(101)	108.8
C(102)-C(101)-H(101)	108.8
C(101)-C(102)-C(103)	103.8(7)
C(101)-C(102)-H(10A)	111.0
C(103)-C(102)-H(10A)	111.0
C(101)-C(102)-H(10B)	111.0
C(103)-C(102)-H(10B)	111.0
H(10A)-C(102)-H(10B)	109.0
N(102)-C(103)-C(104)	112.0(7)
N(102)-C(103)-C(102)	115.2(7)
C(104)-C(103)-C(102)	103.1(7)
N(102)-C(103)-H(103)	108.8
C(104)-C(103)-H(103)	108.8
C(102)-C(103)-H(103)	108.8
N(101)-C(104)-C(103)	101.6(7)
N(101)-C(104)-H(10C)	111.5
C(103)-C(104)-H(10C)	111.5
N(101)-C(104)-H(10D)	111.5
C(103)-C(104)-H(10D)	111.5
H(10C)-C(104)-H(10D)	109.3
N(101)-C(105)-C(106)	111.4(7)
N(101)-C(105)-H(10E)	109.4
C(106)-C(105)-H(10E)	109.4
N(101)-C(105)-H(10F)	109.4
C(106)-C(105)-H(10F)	109.4
H(10E)-C(105)-H(10F)	108.0
C(107)-C(106)-C(111)	117.6(8)
C(107)-C(106)-C(105)	120.2(8)
C(111)-C(106)-C(105)	121.9(8)
C(108)-C(107)-C(106)	120.5(9)
C(108)-C(107)-H(107)	119.8
C(106)-C(107)-H(107)	119.8
C(109)-C(108)-C(107)	120.4(9)
C(109)-C(108)-H(108)	119.8
C(107)-C(108)-H(108)	119.8
C(108)-C(109)-C(110)	120.3(9)
C(108)-C(109)-H(109)	119.8
C(110)-C(109)-H(109)	119.8
C(111)-C(110)-C(109)	119.0(9)
C(111)-C(110)-H(110)	120.5
C(109)-C(110)-H(110)	120.5
C(110)-C(111)-C(106)	122.0(9)
C(110)-C(111)-H(111)	119.0
C(106)-C(111)-H(111)	119.0
N(102)-C(112)-C(113)	105.4(7)
N(102)-C(112)-H(112)	127.3
C(113)-C(112)-H(112)	127.3
C(112)-C(113)-N(104)	108.1(8)
C(112)-C(113)-C(114)	129.9(8)
N(104)-C(113)-C(114)	122.0(7)
C(119)-C(114)-C(115)	117.5(8)
C(119)-C(114)-C(113)	121.5(8)
C(115)-C(114)-C(113)	121.0(8)
C(116)-C(115)-C(114)	121.0(8)
C(116)-C(115)-H(115)	119.5
C(114)-C(115)-H(115)	119.5
C(117)-C(116)-C(115)	120.1(9)
C(117)-C(116)-H(116)	120.0
C(115)-C(116)-H(116)	120.0
C(118)-C(117)-C(116)	119.8(9)
C(118)-C(117)-H(117)	120.1
C(116)-C(117)-H(117)	120.1
C(117)-C(118)-C(119)	120.4(9)
C(117)-C(118)-H(118)	119.8
C(119)-C(118)-H(118)	119.8
C(114)-C(119)-C(118)	121.2(8)
C(114)-C(119)-H(119)	119.4
C(118)-C(119)-H(119)	119.4
C(121)-C(120)-C(124)	116.5(9)
C(121)-C(120)-C(101)	123.9(8)
C(124)-C(120)-C(101)	119.5(8)
C(120)-C(121)-C(122)	120.2(9)
C(120)-C(121)-H(121)	119.9
C(122)-C(121)-H(121)	119.9
C(123)-C(122)-C(121)	118.1(9)
C(123)-C(122)-H(122)	120.9
C(121)-C(122)-H(122)	120.9
N(105)-C(123)-C(122)	124.4(9)
N(105)-C(123)-H(123)	117.8
C(122)-C(123)-H(123)	117.8
N(105)-C(124)-C(120)	125.3(9)
N(105)-C(124)-H(124)	117.4
C(120)-C(124)-H(124)	117.4
C(104)-N(101)-C(105)	114.8(7)
C(104)-N(101)-C(101)	105.0(6)
C(105)-N(101)-C(101)	114.7(7)
N(103)-N(102)-C(112)	110.1(7)
N(103)-N(102)-C(103)	118.6(7)
C(112)-N(102)-C(103)	130.8(7)
N(104)-N(103)-N(102)	108.4(7)
N(103)-N(104)-C(113)	107.9(7)
C(124)-N(105)-C(123)	115.5(8)
Cl(22)-C(201)-Cl(23)	110.6(5)
Cl(22)-C(201)-Cl(21)	110.1(5)
Cl(23)-C(201)-Cl(21)	110.2(5)
Cl(22)-C(201)-H(201)	108.7
Cl(23)-C(201)-H(201)	108.7
Cl(21)-C(201)-H(201)	108.7

Symmetry transformations used to generate equivalent atoms:

Table 4. Anisotropic displacement parameters ($Å^2 x\ 10^3$)for ***trans*-9da**. The anisotropic displacement factor exponent takes the form: $-2\pi^2[\ h^2 a^{*2} U^{11} + ... + 2\ h\ k\ a^*\ b^*\ U^{12}\ ]$

	U^{11}	U^{22}	U^{33}	U^{23}	U^{13}	U^{12}
C(1)	30(5)	31(5)	31(5)	-2(4)	7(4)	-2(4)
C(2)	39(5)	25(5)	35(5)	-8(4)	0(4)	1(4)
C(3)	29(5)	34(6)	34(5)	3(4)	3(4)	-1(4)
C(4)	36(5)	29(5)	36(5)	1(4)	13(4)	-2(4)
C(5)	40(5)	29(6)	54(6)	6(5)	4(5)	2(4)
C(6)	36(5)	26(5)	42(6)	6(4)	1(5)	13(4)
C(7)	61(7)	36(6)	44(6)	13(5)	-2(6)	4(5)
C(8)	65(7)	25(6)	71(8)	-6(5)	8(6)	2(5)
C(9)	62(7)	31(6)	56(7)	7(6)	19(6)	-6(5)
C(10)	78(8)	36(6)	44(7)	4(5)	25(6)	11(6)
C(11)	59(7)	41(6)	40(6)	7(5)	2(5)	-3(5)
C(12)	43(6)	28(5)	33(5)	4(4)	-6(5)	-8(4)
C(13)	35(5)	27(5)	24(5)	3(4)	11(4)	-2(4)
C(14)	23(5)	31(5)	39(6)	15(4)	3(4)	7(4)
C(15)	42(6)	33(6)	38(6)	2(5)	17(5)	5(5)
C(16)	37(5)	28(6)	57(7)	5(5)	-7(5)	3(4)
C(17)	49(6)	27(5)	30(5)	-3(4)	-9(5)	14(5)
C(18)	42(6)	41(6)	31(5)	4(5)	6(5)	11(5)
C(19)	23(5)	36(6)	46(6)	0(5)	4(4)	-5(4)
C(20)	29(5)	20(5)	39(6)	3(4)	8(4)	-2(4)
C(21)	34(5)	37(6)	35(6)	2(5)	2(5)	9(4)
C(22)	31(5)	41(6)	36(6)	-1(5)	0(4)	-3(4)
C(23)	47(6)	24(5)	48(6)	-2(5)	7(5)	5(4)
C(24)	36(5)	23(5)	38(6)	1(4)	2(4)	-1(4)
N(1)	34(4)	24(4)	36(4)	5(3)	9(3)	-8(3)
N(2)	29(4)	23(4)	35(4)	4(3)	1(3)	-2(3)
N(3)	22(4)	31(4)	52(5)	1(4)	9(4)	6(3)
N(4)	36(5)	25(4)	47(5)	-7(4)	8(4)	-1(3)
N(5)	37(4)	45(5)	31(5)	-10(4)	5(4)	2(4)
C(101)	35(5)	34(6)	30(5)	-2(4)	0(4)	2(4)
C(102)	36(5)	33(6)	41(6)	2(5)	-2(5)	6(4)
C(103)	26(5)	25(5)	42(6)	-10(4)	3(4)	0(4)
C(104)	27(5)	37(6)	36(6)	-1(4)	0(4)	-1(4)
C(105)	43(6)	45(6)	39(6)	-11(5)	3(5)	4(5)
C(106)	27(5)	37(6)	28(5)	-2(4)	4(4)	-3(4)
C(107)	50(6)	36(6)	41(6)	-3(5)	7(5)	-2(5)
C(108)	64(7)	34(6)	41(6)	-10(5)	2(5)	-1(5)
C(109)	45(6)	48(7)	38(6)	-11(5)	18(5)	6(5)
C(110)	36(6)	45(7)	49(6)	-7(5)	7(5)	0(5)
C(111)	59(6)	30(5)	24(5)	3(4)	-9(5)	-3(5)
C(112)	22(5)	47(6)	30(5)	3(5)	3(4)	-1(4)
C(113)	15(4)	35(6)	39(6)	-5(4)	4(4)	-6(4)
C(114)	33(5)	41(6)	22(5)	-8(4)	-1(4)	-3(4)
C(115)	35(5)	45(6)	37(6)	-1(5)	11(5)	-8(5)
C(116)	35(5)	35(6)	60(7)	-9(5)	1(5)	-8(5)
C(117)	54(6)	34(6)	42(6)	-4(5)	4(5)	-4(5)
C(118)	43(6)	44(7)	50(6)	7(5)	5(5)	-17(5)
C(119)	28(5)	48(7)	38(6)	5(5)	0(4)	0(5)
C(120)	29(5)	44(6)	34(5)	-2(5)	7(4)	12(5)
C(121)	31(5)	39(6)	59(7)	-8(5)	7(5)	5(5)
C(122)	38(6)	37(6)	58(7)	-13(5)	1(5)	2(5)
C(123)	57(7)	27(6)	69(8)	-1(5)	10(6)	-15(5)
C(124)	25(5)	30(6)	66(7)	-10(5)	-2(5)	2(4)
N(101)	32(4)	43(5)	29(4)	-5(4)	4(4)	-7(4)
N(102)	20(4)	44(5)	26(4)	-5(4)	1(3)	-1(3)
N(103)	28(4)	38(5)	39(5)	-10(4)	6(4)	-1(4)
N(104)	30(4)	44(5)	39(5)	-9(4)	5(4)	-2(4)
N(105)	43(5)	34(5)	73(6)	3(5)	2(5)	-4(4)
C(201)	40(6)	33(6)	60(7)	-5(5)	-2(5)	-16(5)
Cl(21)	83(2)	77(2)	51(2)	6(2)	2(2)	-19(2)
Cl(22)	32(1)	51(2)	100(2)	-4(2)	6(1)	-3(1)
Cl(23)	38(1)	45(2)	82(2)	-6(2)	6(1)	-2(1)

Table 5. Hydrogen coordinates (x 10^4) and isotropic displacement parameters ($Å^2$x 10^3) for ***trans*-9da**.

	x	y	z	U(eq)
H(1)	4510	1133	5459	36
H(2A)	7371	616	6099	40
H(2B)	6022	564	5408	40
H(3)	10532	831	5653	39
H(4A)	10274	1300	4888	40
H(4B)	7841	1153	4594	40
H(5A)	5707	1831	5643	49
H(5B)	5561	1685	4909	49
H(7)	10006	2016	6007	56
H(8)	12879	2436	5756	65
H(9)	13121	2658	4688	59
H(10)	10396	2466	3901	62
H(11)	7477	2058	4154	56
H(12)	6970	349	4336	42
H(15)	6578	-229	3617	45
H(16)	5954	-586	2685	49
H(17)	8793	-613	1902	43
H(18)	12183	-294	2077	46
H(19)	12796	63	3009	42
H(21)	8516	1095	6852	43
H(22)	7558	1260	7918	43
H(23)	3903	1474	8085	47
H(24)	2126	1378	6250	38
H(101)	10478	717	1687	40
H(10A)	9111	448	780	44
H(10B)	7925	824	520	44
H(103)	4572	701	992	37
H(10C)	4599	553	2084	40
H(10D)	6984	331	2050	40
H(10E)	9497	1129	2625	51
H(10F)	8568	735	2851	51
H(107)	7034	1681	2713	51
H(108)	3995	1969	3209	55
H(109)	1424	1626	3789	52
H(110)	1925	989	3909	52
H(111)	4847	697	3375	45
H(112)	7989	-172	836	39
H(115)	8408	-781	267	47
H(116)	9000	-1409	93	52
H(117)	6106	-1831	290	52
H(118)	2699	-1630	707	54
H(119)	2078	-1004	884	45
H(121)	13260	1210	1757	51
H(122)	14306	1822	1557	53
H(123)	11733	2203	1011	61
H(124)	7095	1428	925	49
H(201)	5242	3073	2354	53

Table 6. Torsion angles [°] for ***trans*-9da**.

N(1)-C(1)-C(2)-C(3)	-5.6(9)
C(20)-C(1)-C(2)-C(3)	-125.3(7)
C(1)-C(2)-C(3)-N(2)	-143.1(7)
C(1)-C(2)-C(3)-C(4)	-21.2(9)
N(2)-C(3)-C(4)-N(1)	165.5(6)
C(2)-C(3)-C(4)-N(1)	40.6(8)
N(1)-C(5)-C(6)-C(11)	116.1(9)
N(1)-C(5)-C(6)-C(7)	-60.5(11)
C(11)-C(6)-C(7)-C(8)	2.1(14)
C(5)-C(6)-C(7)-C(8)	178.7(8)
C(6)-C(7)-C(8)-C(9)	-1.8(15)
C(7)-C(8)-C(9)-C(10)	0.8(14)

C(8)-C(9)-C(10)-C(11)	0.0(15)
C(7)-C(6)-C(11)-C(10)	-1.3(14)
C(5)-C(6)-C(11)-C(10)	-177.9(8)
C(9)-C(10)-C(11)-C(6)	0.2(15)
N(2)-C(12)-C(13)-N(4)	0.2(9)
N(2)-C(12)-C(13)-C(14)	-175.9(8)
C(12)-C(13)-C(14)-C(19)	151.0(9)
N(4)-C(13)-C(14)-C(19)	-24.7(12)
C(12)-C(13)-C(14)-C(15)	-30.1(13)
N(4)-C(13)-C(14)-C(15)	154.2(8)
C(19)-C(14)-C(15)-C(16)	0.0(13)
C(13)-C(14)-C(15)-C(16)	-178.9(8)
C(14)-C(15)-C(16)-C(17)	-0.2(13)
C(15)-C(16)-C(17)-C(18)	0.5(13)
C(16)-C(17)-C(18)-C(19)	-0.5(13)
C(15)-C(14)-C(19)-C(18)	-0.1(13)
C(13)-C(14)-C(19)-C(18)	178.8(8)
C(17)-C(18)-C(19)-C(14)	0.3(13)
N(1)-C(1)-C(20)-C(21)	-66.5(10)
C(2)-C(1)-C(20)-C(21)	50.5(11)
N(1)-C(1)-C(20)-C(24)	112.6(9)
C(2)-C(1)-C(20)-C(24)	-130.4(8)
C(24)-C(20)-C(21)-C(22)	0.3(12)
C(1)-C(20)-C(21)-C(22)	179.5(8)
C(20)-C(21)-C(22)-C(23)	0.0(13)
C(21)-C(22)-C(23)-N(5)	-0.3(14)
C(21)-C(20)-C(24)-N(5)	-0.3(13)
C(1)-C(20)-C(24)-N(5)	-179.5(8)
C(3)-C(4)-N(1)-C(1)	-45.4(8)
C(3)-C(4)-N(1)-C(5)	-169.2(7)
C(20)-C(1)-N(1)-C(4)	154.8(7)
C(2)-C(1)-N(1)-C(4)	32.0(8)
C(20)-C(1)-N(1)-C(5)	-79.9(9)
C(2)-C(1)-N(1)-C(5)	157.2(7)
C(6)-C(5)-N(1)-C(4)	-65.5(10)
C(6)-C(5)-N(1)-C(1)	174.2(7)
C(13)-C(12)-N(2)-N(3)	-0.9(9)
C(13)-C(12)-N(2)-C(3)	169.2(8)
C(2)-C(3)-N(2)-C(12)	44.0(12)
C(4)-C(3)-N(2)-C(12)	-73.8(10)
C(2)-C(3)-N(2)-N(3)	-146.4(7)
C(4)-C(3)-N(2)-N(3)	95.8(8)
C(12)-N(2)-N(3)-N(4)	1.3(9)
C(3)-N(2)-N(3)-N(4)	-170.0(7)
N(2)-N(3)-N(4)-C(13)	-1.1(9)
C(12)-C(13)-N(4)-N(3)	0.6(10)
C(14)-C(13)-N(4)-N(3)	177.1(7)
C(22)-C(23)-N(5)-C(24)	0.4(13)
C(20)-C(24)-N(5)-C(23)	0.0(13)
N(101)-C(101)-C(102)-C(103)	-8.4(9)
C(120)-C(101)-C(102)-C(103)	-129.3(7)
C(101)-C(102)-C(103)-N(102)	-141.5(7)
C(101)-C(102)-C(103)-C(104)	-19.2(8)
N(102)-C(103)-C(104)-N(101)	164.6(6)
C(102)-C(103)-C(104)-N(101)	40.2(8)
N(101)-C(105)-C(106)-C(107)	-84.0(10)
N(101)-C(105)-C(106)-C(111)	90.4(10)
C(111)-C(106)-C(107)-C(108)	0.2(14)
C(105)-C(106)-C(107)-C(108)	174.8(8)
C(106)-C(107)-C(108)-C(109)	0.4(15)
C(107)-C(108)-C(109)-C(110)	0.7(15)
C(108)-C(109)-C(110)-C(111)	-2.3(15)
C(109)-C(110)-C(111)-C(106)	2.9(14)
C(107)-C(106)-C(111)-C(110)	-1.8(13)
C(105)-C(106)-C(111)-C(110)	-176.4(8)
N(102)-C(112)-C(113)-N(104)	1.1(10)
N(102)-C(112)-C(113)-C(114)	-178.2(8)
C(112)-C(113)-C(114)-C(119)	157.8(9)
N(104)-C(113)-C(114)-C(119)	-21.5(13)
C(112)-C(113)-C(114)-C(115)	-24.1(14)

N(104)-C(113)-C(114)-C(115)	156.7(8)
C(119)-C(114)-C(115)-C(116)	-1.4(13)
C(113)-C(114)-C(115)-C(116)	-179.6(8)
C(114)-C(115)-C(116)-C(117)	1.4(14)
C(115)-C(116)-C(117)-C(118)	-1.4(15)
C(116)-C(117)-C(118)-C(119)	1.3(15)
C(115)-C(114)-C(119)-C(118)	1.4(13)
C(113)-C(114)-C(119)-C(118)	179.6(8)
C(117)-C(118)-C(119)-C(114)	-1.4(14)
N(101)-C(101)-C(120)-C(121)	112.5(9)
C(102)-C(101)-C(120)-C(121)	-129.0(9)
N(101)-C(101)-C(120)-C(124)	-65.0(10)
C(102)-C(101)-C(120)-C(124)	53.4(11)
C(124)-C(120)-C(121)-C(122)	-0.1(13)
C(101)-C(120)-C(121)-C(122)	-177.7(8)
C(120)-C(121)-C(122)-C(123)	-1.2(14)
C(121)-C(122)-C(123)-N(105)	1.5(15)
C(121)-C(120)-C(124)-N(105)	1.4(14)
C(101)-C(120)-C(124)-N(105)	179.1(9)
C(103)-C(104)-N(101)-C(105)	-174.0(7)
C(103)-C(104)-N(101)-C(101)	-47.1(8)
C(106)-C(105)-N(101)-C(104)	-85.1(9)
C(106)-C(105)-N(101)-C(101)	153.2(8)
C(120)-C(101)-N(101)-C(104)	159.6(7)
C(102)-C(101)-N(101)-C(104)	34.7(8)
C(120)-C(101)-N(101)-C(105)	-73.4(9)
C(102)-C(101)-N(101)-C(105)	161.6(7)
C(113)-C(112)-N(102)-N(103)	-0.7(9)
C(113)-C(112)-N(102)-C(103)	170.6(8)
C(104)-C(103)-N(102)-N(103)	89.5(9)
C(102)-C(103)-N(102)-N(103)	-153.2(7)
C(104)-C(103)-N(102)-C(112)	-81.2(10)
C(102)-C(103)-N(102)-C(112)	36.2(12)
C(112)-N(102)-N(103)-N(104)	-0.1(9)
C(103)-N(102)-N(103)-N(104)	-172.6(7)
N(102)-N(103)-N(104)-C(113)	0.8(9)
C(112)-C(113)-N(104)-N(103)	-1.2(10)
C(114)-C(113)-N(104)-N(103)	178.2(8)
C(120)-C(124)-N(105)-C(123)	-1.2(14)
C(122)-C(123)-N(105)-C(124)	-0.3(15)

Symmetry transformations used to generate equivalent atoms:

7 References

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